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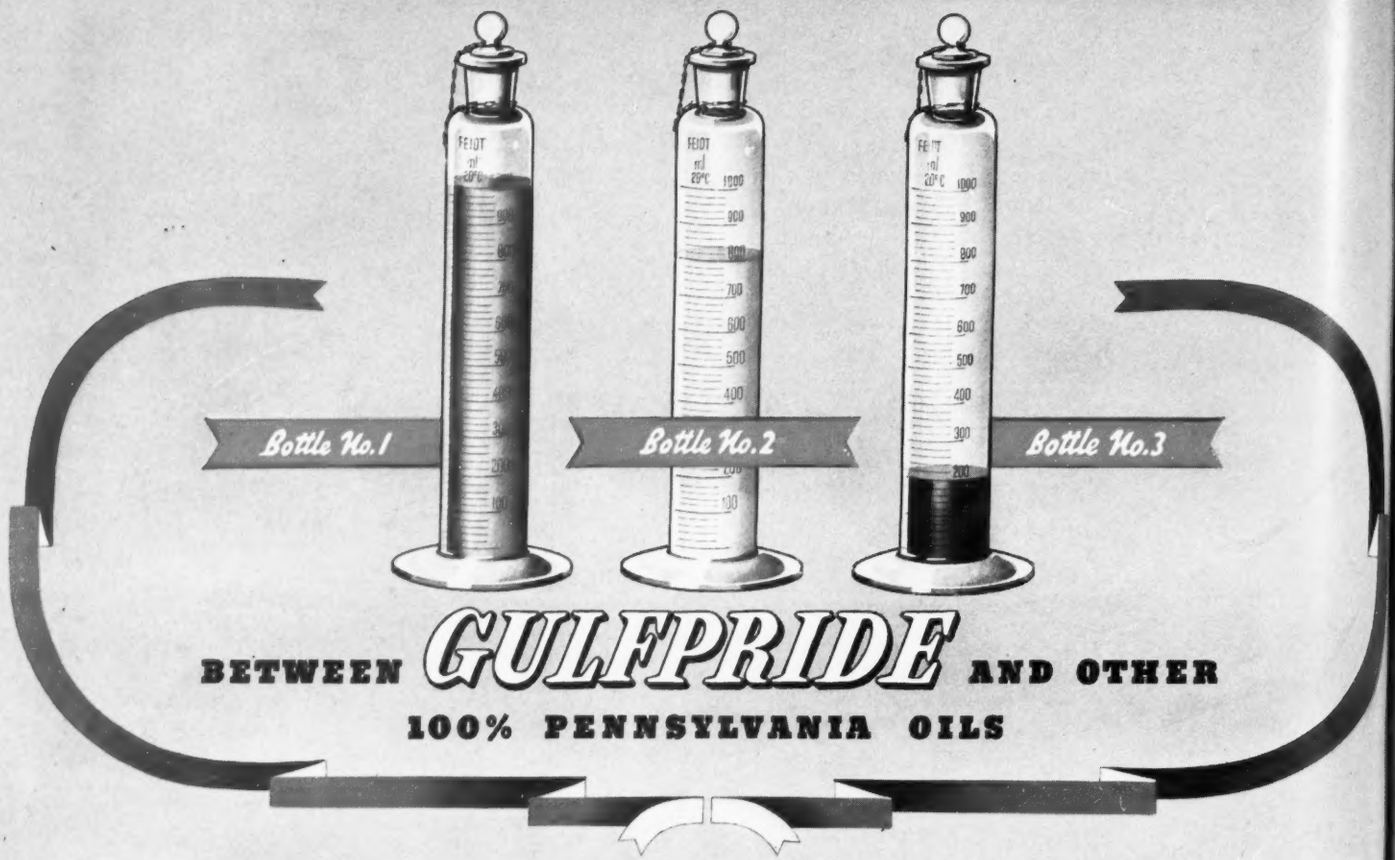

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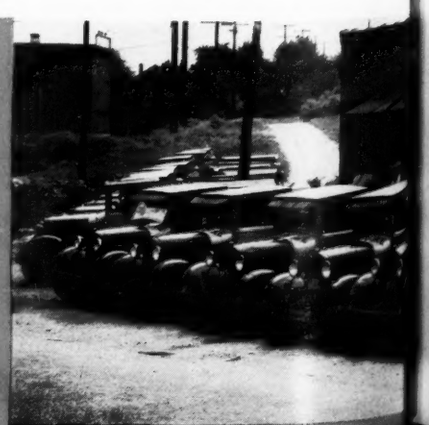

FOOD INDUSTRIES

DISTRIBUTION • PROCESSING

VOLUME 9, NUMBER 4 PUBLISHED MONTHLY

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McGRAW-HILL PUBLISHING COMPANY, INC.

Publication Office: 99-129 North Broadway, Albany, N. Y. *Editorial and Executive Offices:* 330 West 42d Street, New York, N. Y.

Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco, Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

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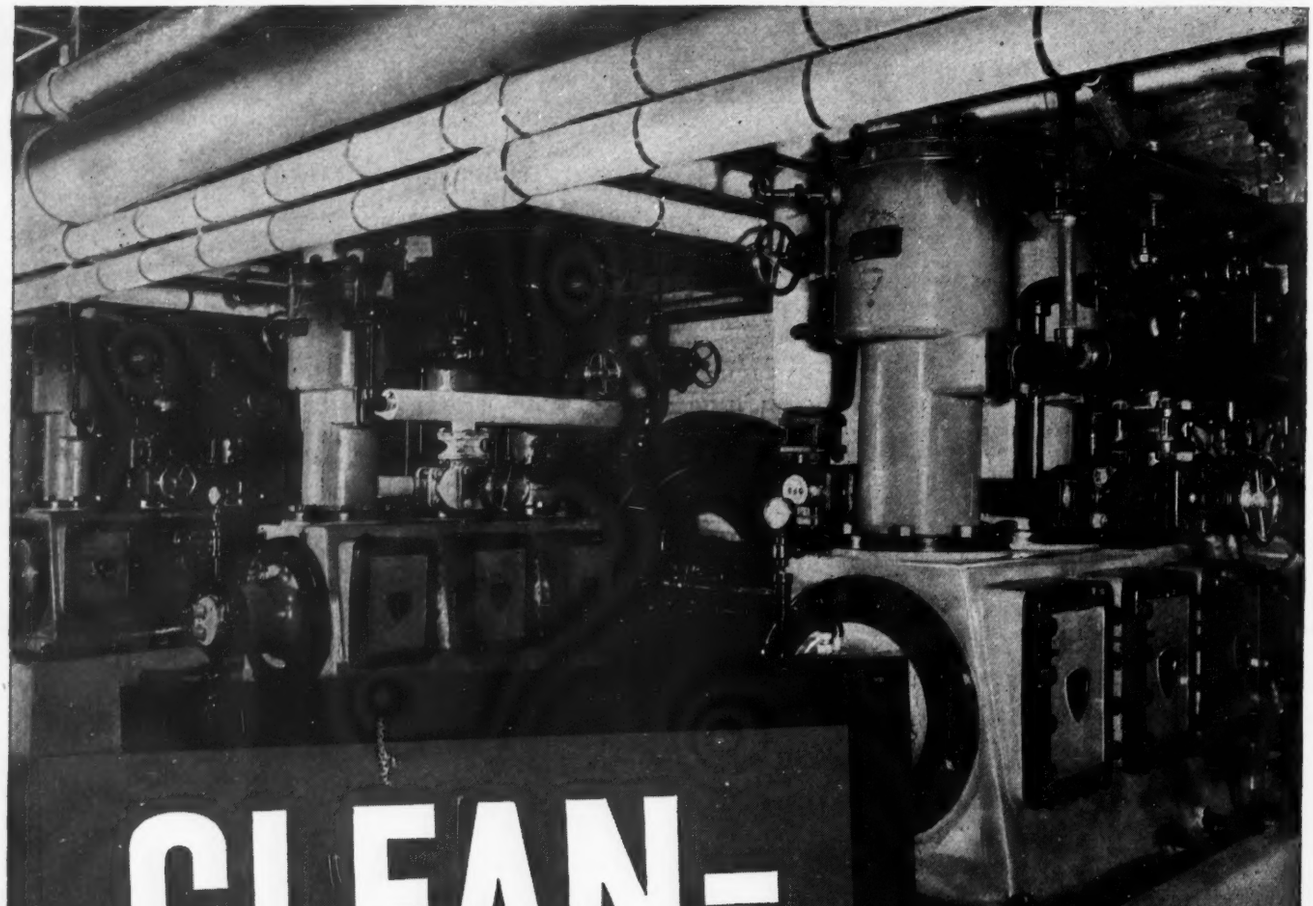
Published monthly: price 35c a copy. Subscription rates: United States, Canada, Mexico, and Central and South American countries, $3 a year. All other countries, $5 a year or 20 shillings. Entered as second-class matter Aug. 17, 1936, at the Post Office, Albany, N. Y., under the act of March 3, 1879. Cable address: "McGrawhill, New York." Member of A.B.P. Member of A.B.C. Contents indexed monthly in the Industrial Arts Index. Copyright, 1937, by McGraw-Hill Publishing Company, Inc.



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FOOD INDUSTRIES

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Established 1928—McGraw-Hill Publishing Company, Inc.

Vol. 9, No. 4

Lawrence V. Burton, Editor

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APRIL 1937

The Talk of the Industry

»LET US HOPE that those food companies which have so commendably raised wages will not suffer the experience of Chrysler Corp. You will recall that it voluntarily raised wages during the General Motors Strike and then experienced a strike in spite of it all.

»WE WISH Mr. George L. Berry, Coordinator for Industrial Cooperation would tell us where he got his new fountain pen that makes a mark $\frac{1}{8}$ in. wide. A recent letter from him, bearing a most imposing signature, relates: "The distressing automobile strike, just ended . . ." We need a new broad gage pen to write an appropriate guffaw.

»QUALITY CONTROL NOTE: What appears to be the ultra-refinement of social nicety is contained in a recent query, "We should be very pleased to learn if any processes or formulae can be obtained for the dyeing of tooth picks with certified food colors."

»EVIDENTLY FARMERS are reading the newspapers very carefully these days, and are deciding that they too should up their contract prices for crops grown to order. One group in Indiana expects the following prices: tomatoes, $18 a ton; peas, $70 a ton; corn, $13 a ton; cabbage, $10 a ton. Some of these prices appear to be pretty stiff unless the raw material is of superlatively good quality and the future markets strong.

Farmers who see labor's income increasing by leaps and bounds, and commodity prices going upward are quick to realize that farm production costs will also climb. They are anticipating that event by their present actions. This will make food and living costs higher and thus humanity travels around the circle to a little higher level of prices with no real gain for anybody except the questionable satisfaction of doing business at higher price levels. Except for those who are in debt there is no real lasting benefit from higher prices.

»THOSE WHO LISTENED to the President's "fireside chat" on March 9 may have been impressed by his note of caution in referring to the future and the "quiet crisis." His remarks, coupled with information we have picked up in Washington, leads us to suspect that he is decidedly worried over the long continued climb of the security markets and commodity prices.

»IT'S AN OLD SAYING that, when you go into competition with yourself, you are the first fellow to get licked. So, many people are wondering what will be the net result of A & P's new supermarkets in certain important cities where they also have many retail stores.

»TO THOSE READERS who helped us out by answering a recent questionnaire we are indeed indebted. This goes doubly to the irate sub-

scriber who wrote on an official, executive letterhead: "The questionnaire habit has gotten to be such a nuisance that we have had to adopt the policy of consigning them all to the waste basket, where yours is going this morning."

Strange as it may seem, it led to the discovery of the whereabouts of an old friend we had lost for 22 years. Business of inviting the irate subscriber to have a drink.

»"JACK DALTON," long to be remembered as a tough guy by those who attended the ill fated AAA hearings on the master code for the food industries, or those who were simple enough to try to get a code from AAA, now has an "executive position" with National Sugar Refining Co. It begins to look as though the

U.S. Department of Agriculture were an excellent spring board into good jobs in the sugar business where experience apparently is not necessary.

Constitution is a Law

THE CONSTITUTION is a law made by the people to govern politicians," says an anonymous writer in *National Petroleum News,* Feb. 24, 1937. "It tells them what they can do and what they cannot do to you. It tells them they may have so much power to control you and no more. . . . We have a law (the Constitution) to govern our politicians and a Court to make them obey that law."

Neglecting Our Duty

WHERE ARE THE CIVIC MINDED CITIZENS of the United States? On a recent auto trip through five states including North Carolina and Virginia, we have talked to hitch hikers, workmen, wives, hotel help, miscellaneous employed persons and business men. In all, the total number interviewed was over a hundred, yet in that sample which is a fairly good cross-section of American life we have not found a single person who is favorable to the President's proposal to increase the size of the Supreme Court. In fact nearly everyone we met is vigorously opposed to it.

But, get this. Up to the moment of writing, we have met only one single person other than ourselves who has written to his or her Senators or Congressmen expressing any opinion or desire in the matter, either *pro* or *con.*

As one kindly old couple in Marion, N. C., put it, "What's the use of writing? They'll vote as they please anyway."

If the American people are developing a defeatist attitude like that, or the "not sufficiently interested" attitude of many others, then the time is fast approaching when our abject submission to the will of those in Washington will most certainly lead to a wholesale loss of our liberty.

In past theory, at least, those in Washington are our servants. But with such meek acquiescence on fundamental issues they may become our masters, in fact, not merely in theory.

Out of 4,400,000 legal voters in New York State only 30,000 had enough interest in the Supreme Court issue to write to Senator Copeland about it, according to his statement on Feb. 12. Think of it. Less than one-tenth of one per cent of the voters took the trouble to instruct their Senator on how to represent their views. The fact that they opposed the President, in the ratio of 50 against him to 1 for him, is of smaller moment than the fact that only a tenth of one per cent of the people are performing their duties as free citizens.

Unless the American public takes an aggressive attitude the source of government will come from a superior power instead of from the will of the people.

What the R-P Law Really Means

A VERY CLEAR EXPLANATION of the real significance of the Robinson-Patman law has been given by Paul S. Willis, president of AGMA. And, in the light of his analysis, certain curious events begin to make sense.

Heretofore the buyer who could get the best price usually made the most money. Less fortunate buyers were always hankering for a basis of equality of prices. Now, whether they like it or not, buyers are all on the same theoretical basis. The resale merchandise purchasing department of the distributor now loses much of its former importance, and it can no longer dictate the policies as it has so often done in the past.

Distributors' profits now must be won on the selling end and by their efficiency of operations.

A Crisis to be Met

EVENTS OF AN ALARMING CHARACTER in the industrial world call for prompt action. Three things are urgently needed: 1. Law enforcement officers must enforce the law and court decrees. Every postponement, however humane the motives, is a move toward an ultimate and more awful wholesale slaughter. This applies also to state governors and the President. 2. The National Labor Relations Act should be promptly amended to correct its one-

Hors d'Oeuvres

• You can either believe it or be a cynic, but there once was a bottle of beer worth $25,000. The last bottle produced by a large Midwestern brewery before Prohibition was insured for that amount. Which probably represented its true value as compared to home brew of lamented memory.

• *Among the stranger and stronger beverages of the world is Kava. It is made in the East Indies from the roots of a species of pepper. Native women chew the root and expectorate into a vessel where fermentation is allowed to proceed.—Thanks, we don't drink.*

• In Germany there will be built a $500,000 factory to produce sugar, vinegar, alcohol and cattle feed from sawdust. Before long, Nazi sawmills probably will be turning out plank steaks.

• *In climates where the temperature is above 85 deg., the amount of milk given by cows drops decidedly. And in Singapore, where the thermometer frequently stands above 100, dairymen have installed air conditioning equipment in the cow barn. But does bovine production really fall off in such hot climates, or does Bossy give evaporated milk?*

• Hens of the United States are laying one thousand eggs a second, day and night, the year around. And believe us, not a stale one in the bunch!

• *History tells us that "Farmer Washington built a roof for pigs." Which is more than most presidents following him have done for their electorates.*

• The most potent source of vitamin A is not the liver of the swordfish but the liver of the *Hippoglossus hippoglossus,* which by any other name would still taste like flounder.

• *A group of Wisconsin potato growers moved men and machines to Florida to produce a winter crop. It seems that Wisconsin imports a lot of spuds and that citizens of the State desire to produce their own food imports.*

• A Hoosier distiller faces Federal action because he advertized that people consuming his beverage might acquire a bright, keen mind. Well, wasn't the brain trust born in the bootleg-booze era?

• *There is a feeling among head waiters that the word "hors d'oeuvre" should be abolished from the jargon of the food field. Menus, they say, should be Anglicized, and dishes served as relishes should be called "appetizers," "dainty bits" or "quaint snacks." Come the revolution and we may have to change the name of this department to "Snicker Snacks." ...*

sidedness and to permit the N.R.L.B. to intervene as a mediator, not merely as an advocate of labor. 3. Labor unions should be required to be incorporated so that they will be legally responsible for their own acts.

New Use For Acetylene

ACETYLENE may some day become an important material for the production department in the canning of pineapples. Its use will be in the crop production end, rather than in the familiar oxy-acetylene welding equipment.

At the University of Hawaii it has been discovered that, in common with ethylene and propylene, acetylene has the property of stimulating the pineapple plant to put out new root processes at unexpected places. It will also cause the plant to put out flower-producing processes instead of foliage. Either a mixture of acetylene with air or a saturated solution of acetylene in water will do the trick. About 50 to 100 c.c. of solution per plant are required.

Plants can be induced to flower a year earlier than normal by the treatment, but the size of the resulting fruit depends on the size of the plant. Many plants other than the pineapple respond in much the same way.

The production department's interest in this new development lies in the possibility of stimulating the fruiting of laggard plants so that the crop can be harvested in a shorter period. Thus a factory will probably be able to clean up the end of the crop more promptly and avoid the dribbles which come in at the end of the season, the packing of most of which entails a higher cost than the bulk of the production.

One suspects that, as the years pass by, the control over nature which can be exercised by such simple chemical methods will have a very important bearing on production costs.

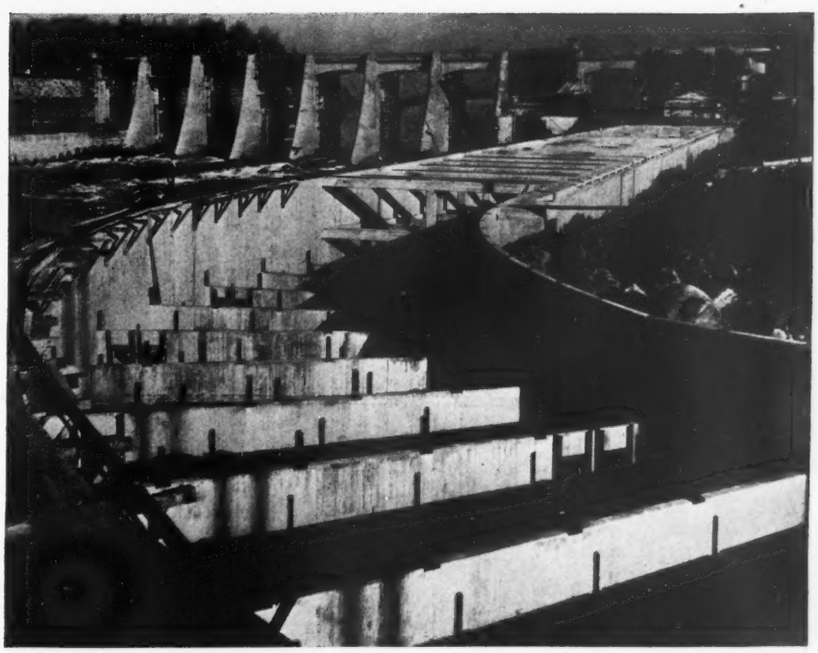
The Open Minded Approach

TWO surprises frequently await the engineer who is unfamiliar with food manufacturing when he visits a modern food plant. One is the dispatch and efficiency with which operations are carried out. The other, the lack of dispatch and efficiency. Both surprises are likely to come in the same department. It seems to be the general rule, with expected exceptions, that high efficiency occurs in standard unit operations, such as packaging. There, each equipment manufacturer has endeavored to make a better machine than his competitor. The inefficiency usually is seen in operations peculiar to a particular plant or product. Such operations are dependent upon the plant management itself for improvement.

To be more specific, we have in mind an operation done manually in many canning plants producing pork and beans. We refer to the cubing of pork fat. Machines sometimes are used by meat packers to cube fat before it goes to the cookers for rendering. Could these not be adapted to the needs of the canner?

We also are thinking of the manual manufacture of molded ice cream specialty products and ice cream sandwiches. The operations involved in producing these products can be mechanized. We know. It has been done by one manufacturer (FOOD INDUSTRIES, Sept., 1936), with great gain in efficiency.

These are merely two examples. If neither applies to you, don't be too quick to crow. But pretend some day that you know nothing about the accepted plant practices in your field and survey your operations with a critical eye. Then ask yourself if that's the best way to do it.



THE ROAD BACK

Columbia River salmon coming back upstream to spawn will climb this ladder to get past Bonneville Dam. About 100,000 fish are expected to use the ladder daily during the spawning season, and those not caring to exert themselves will be raised to the upstream level in fishway locks, or elevators. These locks and ladder are intended to preserve an industry which yields fishermen about $10,000,000 annually. The salmon industry hopes the devices work as planned, because the Columbia River is the largest salmon breeding ground in the world.

More on Pressure Processing of Dairy Products

TO DISCUSS TECHNICAL PRINCIPLES in any active field nearly always involves methods or processes often covered by patents. When Milton E. Parker wrote on the subject of Pressure Processing of Dairy Products, F.I. 8, 74, 1937, he presented an able discussion of principles, not equipment or patents. However, the Grindrod Process Corporation is of the opinion that the readers of FOOD INDUSTRIES should be informed that many patents covering certain phases of the discussion are owned by that corporation and suggests that the following list of U.S. Patents be made public.

1,714,597	2,019,491	1,797,769
1,819,023	2,020,369	1,798,120
Re. 19,193	1,979,685	1,854,189
Re. 19,868	1,993,511	

Grindrod Corporation also indicates that other patents are pending. Undoubtedly other patents are involved which are owned by other firms or individuals.

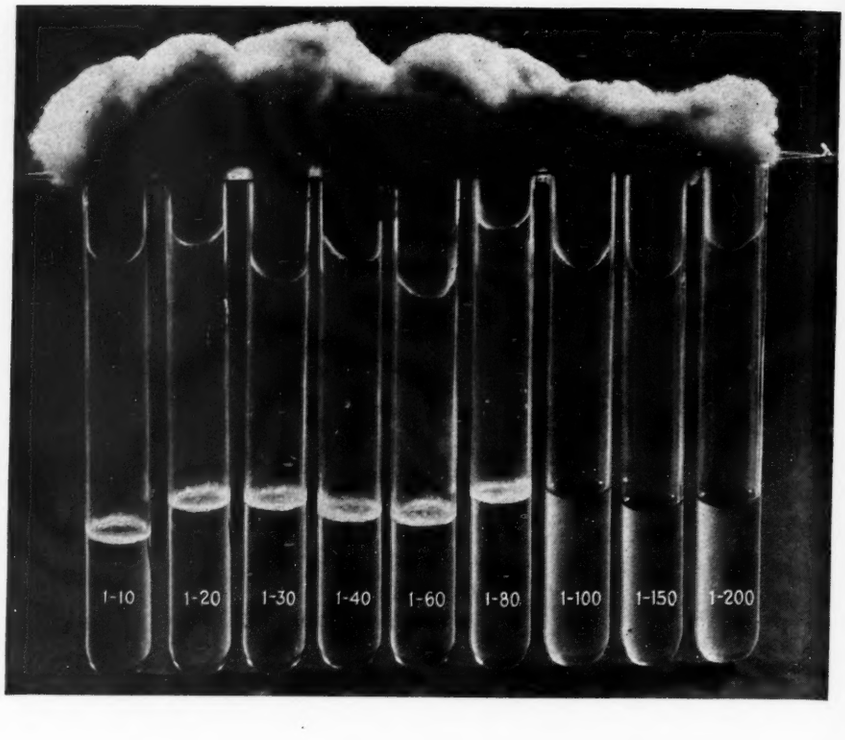


Fig. 1—Number of "rope" spores per gram of material tested is taken as the reciprocal of the highest dilution showing a pellicle or surface growth. Count in this test is 80 spores per gram of material.

Baker betters bread quality by positive identification of ingredient materials likely to cause "rope" development

Count the Spores

AVOIDANCE OF "ROPE" IN BREAD through laboratory control over the selection of ingredients is evidence of what can be done to assure a finished food product of predetermined quality.

The procedure upon which this control is based was worked out in the laboratories of the Ward Baking Co. in New York City and has been in commercial use for several years.

In the application of this positive control over quality all ingredients of unknown origin and characteristics are subjected to laboratory bacteriological examination before being used. If the examination rates a proposed ingredient as being definitely a "rope" carrier, that material is rejected. On the other hand, if the test shows that the proposed ingredient might be a "rope" carrier, the warning makes possible those adjustments in bakeshop technic which will prevent the development of "rope" when a border-line ingredient is used. Equally important, the results of these tests warn ingredient manufacturers that their plant operations need to be put under better bacteriological control.

Also the practice of putting all ingredients under test has supplied proof that the development of "rope" in bread is quite generally caused by ingredients other than flour, which has borne the suspicion for many years.

Development of "rope" in bread is an old problem and one of the most troublesome to the baker. It is a bacterial disease which develops in the various types of home-made and commercial breads. (Fig. 2).

The work of several investigators has shown that several strains of spore-forming bacilli cause the disease. The spores of these bacilli—widely regarded as members of the *Bacillus mesentericus* group — are quite resistant to heat, survive baking temperatures, and subsequently grow in bread during hot, humid weather.

Although "rope" has been definitely proven to result from growth of bacterial spores, the sources of infection had never been clearly traced until the procedure to be described was perfected in the laboratories of the Ward Baking Co.

As early as 1898 yeast was suspected but no conclusive evidence was produced. As a victim of circumstances, flour came to be regarded as the only material responsible for the development of rope in bread. That belief became so strong that the baking industry was practically convinced that it was so. But a change of flour did not always clear up the trouble. In explanation unsanitary bakeshop conditions were regarded as contributing and aggravating causes of "rope" infection.

General acceptance of the conviction that "rope" infections were largely unavoidable and that "rope" bacteria were normally present in flour led to the working out of methods for delaying or stopping the growth of bacteria in bread. These efforts were in the nature of an attempt to control the quality of the bread while it was in the dough stage; after the ingredients—selected at random—had been started on their way towards becoming bread.

Studies were made to show that a definite relationship existed between the acidity of the bread and the growth of "rope" bacteria. Lactic acid, vinegar and acid phosphate were studied as preventatives or remedies for "rope." In the course of these studies discovery was made that "rope" bacilli will not grow in a

Experimental procedure and results are published in greater detail in April, 1937 *Industrial and Engineering Chemistry* of the American Chemical Society, in article entitled "Control of Rope in Bread" by Charles Hoffman, T. Robert Schweitzer, Gaston Dalby of Ward Baking Co. Research Lab., New York, N. Y.

medium having an acidity of more than pH 4.6.

This method of quality control became ineffective as bakers increased the richness of their bread. With the use of higher percentages of milk solids conditions for the growth of "rope" bacteria became increasingly favorable because as the quantities of milk solids increase, other factors remaining the same, the pH. of the bread becomes higher; the acidity is lowered, (See table). When used as a bread ingredient milk acts as a buffer in the dough, resists development of acidity, and permits a greater variation in length of fermentation period. Through this buffer action vinegar, acid phosphate, and lactic acid lose more and more of their effectiveness as the percentages of milk solids in bread are increased.

Experiences with various practices to prevent development of "rope" indicated to Ward Baking Co. research workers that the best procedure was to find out what ingredients were "carriers" of "rope" spores and to determine the "rope" spore content of doughs which later became "ropy" bread. It was thought that with this data available a more definite bakeshop practice could be followed to keep "rope" from developing.

The first step was to hit upon a test procedure which would give a reliable estimation of the number of bacterial spores present in the materials used. The dilution method well known in water and milk investigation work was the most promising because "rope" bacilli forms a pellicle or surface growth on standard bouillon culture medium. This pellicle is a cultural characteristic which serves to identify "rope" bacteria from most of the other species of spore-forming bacteria.

It should be remembered however that estimation of the spore-producing bacteria by this procedure includes not only the various strains of "rope" spores but also the spores of such other bacteria as have the ability to produce the pellicle or surface growth in nutrient broth. To find out what allowance should be made for the other bacteria check tests were made in the early stages of this control work to identify the "rope" producer in the presence of the other pellicle-forming bacteria. Each tube of bouillon that developed a pellicle was examined by a microscope and pieces of sterile moist bread in test tubes were inoculated with the pellicle-forming culture, incubated, and observed for the development of "rope." As the test work progressed the procedure was simplified by omitting the sterile bread test because in almost every instance the pellicle-forming spore proved to be a "rope" spore. With this point settled the dilution method can be regarded as a quantitative test for "rope" spores and the counts obtained can be considered as "rope" spore counts.

The procedure is as follows:

Weigh out 2 grams of a representative sample of the material under test in as aseptic a manner as possible. Transfer into a 250 cc. glass-stoppered dilution bottle. Add approximately 10 grams sterile sea sand. Measure 96 cc. distilled water into the dilution bottle to give a 1 to 48 dilution. Shake the dilution vigorously 50 times. Each shake is an up and down cycle of about 1 ft. This dilution is used to determine spores up to 200 per gram of material by pipetting varying volumes of the 1 to 48 dilution into test tubes containing 10 cc. sterile broth. 4.8 cc. are used for 1–10 dilution.

A dilution of 1 to 1,000 is used to determine spores between 250 and 20,000 per gram of material. This dilution is made immediately after the 1 to 48 dilution has been shaken and the sand has settled by pipetting 4.8 cc. of that dilution into another 250 cc. glass-stoppered dilution bottle containing 95.2 cc. distilled water. Shake the 1 to 1,000 dilution 25 times as previously specified, let sand settle and pipette varying volumes of the dilution into test tubes containing the 10 cc. of nutrient broth. 4.0 cc. gives 1–250 dilution.

Dilution to determine spores present in numbers between 25,000 and 100,000 is made by pipetting 1 cc. of the 1 to 1,000 dilution into 99 cc. of distilled water. This 1 to 100,000 dilution is shaken 25 times, sand allowed to settle, and the nutrient broth inoculated. 4.0 cc. gives 1–25,000.

The tubes of inoculated nutrient broth are heated in an Arnold sterilizer for 30 min. at 100 deg. C. to kill all bacteria not in the heat-resisting spore state. Time of heating begins when the temperature of the sterilizer reaches 100 deg. C. After heating, the tubes are incubated at 37.5 deg. C. for 48 hours. At the end of 48 hours the tubes are carefully examined for the presence of a surface growth. Presence of a pellicle or any surface growth is a presumptive test for "rope" spores.

Results for each dilution are recorded as plus or minus depending on whether a surface growth is present or absent. The number of "rope" spores per gram of material tested is taken as the reciprocal of the highest dilution giving a positive result. An exception is made in the case where a negative result is obtained in a dilution lower than the highest dilution giving a positive result. Then the result should be recorded as indicating a number of "rope" spores equal to the reciprocal of the dilution next lower than the highest one giving a positive result. The quantitative estimation is not complete unless at least the two highest dilution tubes show negative results. (See Fig. 1).

A long series of dilutions is not necessary in all cases. The work may be shortened considerably for routine examinations and for the sorting out of suspicious samples. The 1 to 48 dilution is enough for materials which consistently show negative or low "rope" counts.

Exact bacteriological technic must be observed throughout the test. All glassware and media must be sterile and the work must be carried on far removed from dust and draughts.

The preparation of the 1 to 48 dilu-

Fig. 2—"Rope" in an advanced stage is shown in loaf on right. Loaf on left is normal. "Rope" development is well along in middle loaf.

▶ ***"Rope" in varying forms is an industrial disease of several food manufacturing and processing industries. Results discussed in this article prove that it is a disease which can be kept in check, if not fully avoided, through bacteriological control over ingredient materials used.***

Control procedure followed has possible application in

Baking
Brewing
Flour milling
Dairying
Malt extracting and drying
Meat curing
Milk handling
Olives (pickled)
Pickle making
Sauerkraut manufacture
Yeast growing

tion will vary slightly depending on the nature of the material to be tested. In the case of liquid materials such as water and milk, 2 cc. of the material to be examined are diluted with 94 cc. distilled water. In the case of solid materials such as flour, yeast, and sugar, 2 grams of the sample are suspended in 96 cc. water.

COARSE MATERIALS such as grains should be ground to pass at least a 20 mesh sieve before using in dilutions. It is permissible to use larger quantities of sterile sand than specified providing the material is of such nature that ordinary shaking with 10 grams of sand fails to break up the materials properly.

If larger quantities of media than 2 grams are used to make the tests, the period of heating in the Arnold sterilizer must be increased. This applies in the case where special tests are made on flour and water which may be made when they show less than 10 "rope" spores per gram.

The special test is made as follows:

Weigh 1, 2, 5, and 10 gram portions of flour under as aseptic conditions as possible into Erlenmeyer flasks containing 100 cc. of sterilized standard boullion. Mix the flour and boullion with a whirling motion. Be careful not to wet the cotton plug. Heat the flasks in the Arnold sterilizer for at least one hour after the sterilizer has reached a temperature of 100 deg. C. Incubate at 37.5 deg. C. for 48 hours. After the incubation period test tubes of sterile nutrient broth are inoculated with several platinum wire loops of culture from each flask. The inoculated tubes are heated for 30 minutes at 100 deg. C. in an Arnold sterilizer, and incubated for 48 hours.

Absence of a pellicle or surface growth in the test tubes is recorded as zero spores per 10 grams of flour. The development of a pellicle in any of the test tubes is recorded as indicating one "rope" spore per quantity of flour used in the Erlenmeyer flask which the inoculation has been made. An exception is made in the case where a negative result is obtained in a larger quantity of flour than the next smaller quantity showing a positive result. Then the result should be recorded as indicating 1 "rope" spore per quantity of flour used in the next larger quantity than the smaller amount showing a positive result.

During 1926, '27, and '28 hundreds of flour samples were examined by this method. These samples included patent, clear, rye, and whole wheat flours. The "rope" spore counts ran as high as 150 per gram of flour although many samples showed negative results. During the summer of 1928 "rope" spore counts of all the flours tested gave negative results as they have for the past eight years. This statement means that "rope" spores have not been found in any flour sample examined even when tests were made with a maximum of 10 grams of flour; the characteristic pellicle-forming organisms were absent. However, flours are constantly under test in Ward Baking Co. laboratories because a flour containing "rope" spores would introduce a considerably greater number of "rope" organisms into the doughs than any other ingredient having the same "rope" spore count per unit weight. Improved methods of harvesting and milling of American grains appear to have a beneficial effect on the flour as far as "rope" bacilli is concerned.

Examination of the flour alone failed to show all the possible sources of "rope" contamination. In the summer of 1928 "rope" developed in the bread even though "rope" spores were not present in the flour. To explain this condition, which was contrary to the generally accepted beliefs, counts were made on the milk, sugar, salt, yeast, malt, shortening, and water used in the bread. Significant numbers of "rope" spores were found in yeast and malt. "Rope" spores were absent in the other ingredients. Daily counts on yeast shipments showed a decided variation. These counts ranged from 40 to as high as 20,000 per gram in a period of ten days.

These counts helped to explain not only how "rope" development in bread could vary greatly in intensity from day to day but also why the usual expedients appeared to be more effective on some days than on others.

The effect of the "rope" spore counts of yeast on "rope" development was observed in wrapped loaves of bread incubated at 37.5 deg. C. These experiments were run in conjunction with plant operations by having the loaves on test taken from average runs of bread produced in the plant. In this way a definite relationship was found to exist between the "rope" spore count of the yeast and the development of "rope" in the incubated loaves. When the "rope" spore count of the yeast increased materially the bread developed "ropy" condition on incubation.

These observations and tests with commercial bread were further confirmed by laboratory experiments. The pellicle-forming cultures obtained from the yeast were put into laboratory doughs and the resulting loaves incubated and compared with bread made from the same dough without the culture. The control loaves were normal; the inoculated loaves developed "rope" in 24 hours. Further checks were made by comparing bread made with yeast having a low "rope" spore count and with bread made from yeast having a high spore count. These results also confirmed the observations made on commercial runs of bread.

Makers of compressed yeast supplying the Ward Baking Co. also benefited by these tests. When faced with the results of the tests they took steps to reduce the "rope" spore content of their yeast. The success of the cooperative effort is shown in that a large percentage of yeast shipments to the Ward Company during the past four years show ten or less "rope" spores per gram of yeast. Counts that reach 100 are rare.

Malt extracts also proved to be dangerous possible sources of "rope" infection. Malt samples, like yeast, showed considerable variation, some counted as high as 10,000 "rope" spores per gram. Manufacturers of malt took the evidence to heart and have corrected their factory conditions to the extent that malt relatively free from "rope" spores can now be bought.

As a result of these studies on the relationship between the spore counts in ingredient materials and the development of "rope' in the baked loaf tentative standards have been set up to meet the conditions under which the Ward Baking Co. plants operate.

Counts of 20 per 100 grams of flour, 100 per gram of yeast or malt, and 10 per gram of other ingredients are considered objectionable and subject to rejection for use in bread making.

No evidence of "rope" spores has been found in the milk products, salt, or water used by Ward Baking Co. Molasses and sugar have at times shown small numbers of "rope" spores but little difficulty has resulted from these products. There is always the possibility, although highly improbable, that the additive effect of "rope" spores present in several ingredients, even in low counts, might result in "ropy" bread.

The fact that the Ward Baking Co. and some of the companies supplying ingredient materials have used this quality control procedure for several years with very evident success gives proof of its value.

Effect of Milk Solids on Acidity of Bread

Skimmed Milk Solids Per Cent (Based on Flour)	*pH of Bread*
3.0	5.37
6.0	5.58
9.0	5.68
12.0	5.70

An island display, in McCann's downtown Pittsburgh store, from which many expensive gift packages were sold during the 1936 Christmas holidays. Fancy gift packages of food brought as high as $50 each.

Price or *Quality*

THE BEST INDEX of an approaching depression is the slackening of building trade activities. The best proof that the depression is on is the lagging sales of quality merchandise. The return of building heralds the end of depression. Active demand for quality merchandise marks the depression's end and the presence of new prosperity.

During the depression there were definite trends toward the corporate chain type of cash-and-carry bottom-price buying. Many service type stores, once profitably established in their communities, lost ground or were wiped out altogether. There are many indications today, however, that former service store customers are returning, willing to pay for the luxury of a charge account, delivery and a more varied range of foods.

The McCann Company in Pittsburgh, operated on a cash-and-carry basis, built up through the years a store volume that reached, shortly before the depression, $5,000,000 annually. During the depression McCann's one downtown store suffered considerably from the competition of neighborhood cash-and-carry stores. Toward the end of the depression, to recover lost ground, McCann's offered delivery service to its customers, not free delivery, but delivery at 10 cents per order. McCann's have since assumed another function of the service store. They have offered credit to their customers. However, not the indefinite "pay when you can" credit of pre-depression days, but instead, credit on a public utility basis, "payment when due or service discontinued." The extent to which customers used both of these services convinced McCann's that the service store was again about to fill a very definite need in the market. They therefore stocked a large line of expensive quality merchandise. They not only stock a luxury line but give it the best display in the store.

Fancy merchandise, expensive merchandise, quality merchandise, all are selling. During the holiday season just passed, McCann's featured fancy packed food baskets and boxes through window and inside, island, spot-lighted displays. Prices ranged up to $50 each. Forty letters to selected clients netted 22 sales, all at prices above $20 per basket. The volume of sales from these displays prove that the luxury buyer is again in the market.

When penny-pinching was the necessary, as well as the popular, pastime, the home menu maker contented herself with the limited, rapid turnover items of the chain store. Now she is releasing her pent-up desires for variety, her longing for the untried and even for the expensive. In McCann's, from one well located and arranged display, she is buying fancy glass packed fruits, priced at $1.00 to $1.50 per quart. She is sampling eagerly of a large variety of expensive imported foods, she is buying viands never on her list before.

No, this buying does not come entirely from the upper crust, far from it. Housewives in the middle class are loosening their stranglehold on the long guarded budget. Once again they are entertaining and with enthusiasm. Frequent are the lunches, dinners, bridge and cocktail parties.

(*Turn to page* 223)

Sugar, Starch *and* SPOILAGE

Ingredients play an important part in bacterial control with non-acid canned foods.

By E. J. CAMERON

Assistant Director, Research Laboratories, National Canners Association, Washington, D. C.

WE DISCOVERED IN 1926 that refined sugar was a frequent carrier of "flat sour" bacteria. Later that same year, we found that the insidious thermophilic "sulphide spoilage" organism also was to be found in sugar, and this ingredient was the cause of one of the most costly outbreaks of spoilage which we have on record. Still later, we learned that the gas-forming thermophilic anaerobes were also present on occasion. This completed our bacteriological picture, because these three groups comprise the list of thermophilic bacteria important in the spoilage of non-acid canned foods.

As the outgrowth of work which established a relation between the bacterial condition of sugar and thermophilic spoilage in non-acid canned products, the first statement of bacterial standards for sugar was announced in 1931. The publication of standards followed a desire on the part of canners to buy sugar that had been tested for suitability for canning. Beyond this, sugar producers had asked for some guide which they might follow in appraising the bacterial quality of sugar. The result is that now the canner and the sugar producer each knows what the other is talking about when he refers to "canners'" sugar, and such sugar usually is available, at no increase in cost, to any canner who asks for it.

As a technical matter, the problem has been solved by cooperation of the canning and sugar branches of the food industries. During the past few years, therefore, our laboratory has concerned itself only to the extent of examining samples sent in by members for the purpose of determining whether deliveries conform to specifications. Table I presents the results of examination of sugar samples over the six-year period, 1931-36.

In considering the results given in Table I, it should be emphasized that the cross-section which is pictured is not representative of sugar in general. Most of these 2,000 samples were submitted by canners as a check of the condition of "certified" sugar purchased by them. If one were to examine sugar samples at random, the proportion falling below standard would be much greater. In general, this table illustrates that most of the "certified" sugar is of suitable bacterial quality.

Table II gives the results of the experimental corn packs in which sugar contaminated with flat sour bacteria was used. From the results which are given, it is seen that any bacteria from the suitable sugar were destroyed by the 70-minute process. But 95.8 per cent of cans containing the unsuitable sugar were not sterilized. Furthermore, even after 90 minutes at 250 deg. F., more than 50 per cent of the cans had not been sterilized. Incubation of all lots was at 130 deg. F., and possibly none of this spoilage would have occurred at temperatures below 100 deg. F. But the significant thing is that a canner who used this sugar would be marketing a non-sterile product, subject to spoilage, even though his canning practice and equipment were most modern.

Table III gives results following the use in corn of sugar contaminated with thermophilic anaerobes. The contrast in spoilage between sugar A and sugar B points unmistakably to the significance of thermophilic anaerobic contamination of sugar. Even after the 90-minute process at 250 deg. F., which is twenty minutes over the recommended process, there was 25 per cent spoilage in the corn packed with contaminated sugar. Unlike the flat sour spoilage previously referred to, most, if not all, of this spoilage would be expected to occur sooner or later at ordinary storage temperatures.

The experimental pack of peas followed the plan of the corn experiments. Three lots were compared: (*a*) no sugar, (*b*) low-count sugar, (*c*) contaminated sugar. The low-count sugar carried not more than a trace of thermophilic contamination. The contaminated sugar, while within standard with respect to flat sour organisms, was below standard in regard to thermophilic anaerobes and sulfide-spoilage bacteria. The peas were ungraded sweets which were blanched and filled by hand. The brine, which was also added by hand,

Based on a paper entitled, "The Present Status of the Sugar Problem with Non-Acid Foods," presented at Canning Problems Conference, Convention of National Canners' Association at Chicago, Jan. 27, 1937.

consisted of 5 per cent sugar and 2.5 per cent salt. Processes were at 240 deg. F., for 20, 25, 30 and 35 minutes, the longest process being the one which is recommended by our laboratory. Incubation was at 98 deg. F. for fourteen weeks, after which time all remaining flat cans were tested for flat sours and sulphide spoilage. The good cans were then closed aseptically, kept at 130 deg. F. for one week and then tested for obligate thermophiles.

The results of this pack (Table IV) are striking in pointing to the certainty of spoilage under normal conditions of storage temperature. In the shortest two processes, greatest spoilage occurred during the incubation at 98 deg. F. In the longer processes, spoilage was substantial at that temperature. Even after the recommended process of 35 minutes at 240 deg. F., there was 50 per cent spoilage. In contrast, however, there was no spoilage at the shortest process of twenty minutes at 240 deg. F. when the peas were canned without sugar or with acceptable sugar.

It is only fair to say that we have used certain lots of contaminated sugar in experimental packs without inducing abnormal spoilage. This, however, is important only in giving further testimony to the fact that variation in resistance is to be expected in spores of the thermophilic group.

Studies also were made on the effect of contaminated starch on corn. The pack was divided into three lots, to one of which no starch was added; the second contained starch which was bacteriologically suitable; the third was put up with contaminated starch which contained significant numbers of all three types of thermophilic organisms—flat sours, thermophilic anaerobes and sulphide-spoilage bacteria. When added, starch was introduced to the extent of 1.5 lb. to 75 lb. of cut corn. To this were added 6 gal. of brine made up in the proportion of 10 lb. of salt and 110 lb. of sugar per 80 gal. of water. All lots were processed 45, 60 and 70 minutes at 250 deg. F., following which they were incubated at 98 deg. F. for eight weeks, and at 130 deg. F. for one week.

The most striking result of this work (Table V) was the occurrence of all three types of thermophilic spoilage during the incubation at 98 deg. F. This was the first time such a result has been obtained when the contamination was introduced with some ingredient. It has been especially difficult to induce development of sulphide spoilage in this way, yet in this case, four cans showed spoilage—all of them from the lot put up with the contaminated starch. Beyond this, there has been the contrast which has been emphasized in sugar experiments. In the significant processes of 60 and 70 minutes at 250 deg. F., no spoilage occurred with the "no-starch" lot or the "low-count" lot. The "high-count" starch, however, induced spoilage in both processes. In the case of the shortest process of 45 minutes, there was a marked contrast between spoilage results for the high-count lot and the others.

While the contamination of sugar and starch is established as significant, increasing consideration is being given to other ingredients of canned foods. Spoilage has been traced to flour of one type or another in spaghetti, beans and chowders. And such ingredients as dried milk and mushrooms have been suspected of causing spoilage in creamed soups. It is expected that over the next period of four or five years, considerable progress will be made in further defining the importance of contamination control.

Table I—Results of Examination of Sugar Samples, 1931–36

Year	Total Samples	Within Standard Per Cent	Below Standard Per Cent
1931	314	93.6	6.4
1932	161	94.5	5.5
1933	154	99.3	0.7
1934	204	76.5	23.5
1935	814	82.7	17.3
1936	564	93.1	6.9

Table II—Spoilage in No. 2 Cans of Corn Due to the Presence of Flat Sour Bacteria in Sugar

Processed at 250 Deg. F.	Per Cent Spoilage in Corn with		
	No Sugar	Sugar A[1]	Sugar A[2]
70 min.	0	0	95.8
80 min.	0	0	75.0
90 min.	0	0	54.2

[1] Suitable for canning non-acid products "Flat sour" count, 60 spores per 10 grams sugar.
[2] Suitable for canning non-acid products. "Flat sour" count, 2,500 spores per 10 grams sugar.

Table III—Spoilage in No. 2 Cans of Corn Due to the Presence of Thermophilic Anaerobic Bacteria in Sugar

Processed at 250 Deg. F.	Per Cent "Swell" Spoilage in Corn with		
	No Sugar	Sugar A[1]	Sugar B[2]
50 min.	0	0	100
70 min.	0	0	70.2
80 min.	...	0	46.7
90 min.	...	0	25.0

[1] Free from all spoilage thermophiles.
[2] High in spoilage thermophiles, especially thermophilic anaerobes.

Table IV—Per Cent of "Swells" in Experimental Pack Due to Thermophilic Anaerobes in Sugar

Process Time at 240 Deg. F.	No Sugar (Per Cent)	Sugar A[1] (Per Cent)	Sugar B[2] At 98 Deg. F. (Per Cent)	Sugar B[2] At 130 Deg. F. (Per Cent)	Sugar B[2] Total (Per Cent)
20 min.	0	0	58.3	25.0	83.3
25 min.	0	0	58.3	29.2	87.5
30 min.	0	0	37.5	41.7	79.2
35 min.	0	0	20.8	29.2	50.0

[1] Low-count sugar.
[2] Contaminated sugar; flat sours, 60 per 10 gm.; thermophilic anaerobes 5+; sulphide spoilage, 8 per 10 gm.

Table V—Spoilage in Corn due to Starch Contamination

Condition	Time at 250 Deg. F.	Cans	Number of Swells	F.S.[1]	S.S.[1]	O.K.[1]	Per Cent Spoilage
Results at 37 Deg. C. (98 Deg. F.) after 8 Weeks' Incubation							
No starch	45	24	2	0	0	22	8.3
Low count	45	24	1	0	0	23	4.2
High count	45	24	6	4	3	11	54.1
No starch	60	24	0	0	0	24	0
Low count	60	24	0	0	0	24	0
High count	60	24	0	0	1	23	4.2
No starch	70	24	0	0	0	24	0
Low count	70	24	0	0	0	24	0
High count	70	24	1	0	0	23	4.2
Results at 55 Deg. C. (130 Deg. F.) after One Week Incubation							
No starch	45	22	2	0	0	20	9.0
Low count	45	23	2	0	0	21	8.6
High count	45	11	5	5	0	1	90.9
No starch	60	24	0	0	0	24	0
Low count	60	24	0	0	0	24	0
High count	60	23	5	6	0	12	47.8
No starch	70	24	0	0	0	24	0
Low count	70	24	0	0	0	24	0
High count	70	23	0	2	0	21	8.6
Total Spoilage Results at 37 Deg. C. and 55 Deg. C.							
No starch	45	24	4	0	0	20	16.6
Low count	45	24	3	0	0	21	12.5
High count	45	24	11	9	3	1	95.8
No starch	60	24	0	0	0	24	0
Low count	60	24	0	0	0	24	0
High count	60	24	5	6	1	12	50.0
No starch	70	24	0	0	0	24	0
Low count	70	24	0	0	0	24	0
High count	70	24	1	2	0	21	12.5

[1] F.S., Flat sour spoilage; S.S., sulphide spoilage; O.K., no spoilage.

The effect of ingredients on the spoilage of non-acid canned foods is of importance not alone to users of the ingredients but also to producers of them. So this article is of interest to

Canners
Sugar Refiners
Starch Manufacturers
Dried Milk Manufacturers
Millers

IMPROPER CONTAINERS

Containers like these should not be used for samples. They permit seepage of fat and moisture. Moreover, it is easy to change the contents and reseal the container. Surprisingly, these containers are used by official agencies, even in some large cities.

LABORATORY CONTROL is a most important function of food inspection and examination. And it is universally recognized as an activity that must be carried out by exacting methods and procedures. Yet samples of food to be analyzed often are kept under conditions which actually alter the composition of the product.

Routine laboratory food-control work is generally subdivided into bacteriological and chemical examinations. In order to make for greater uniformity and standardized, comparable results, a definite procedure is recognized in bacteriological examinations from the time of sampling to the end of the examination. Methods of sampling are prescribed, types of containers are designated and various other details are set forth to a minute degree. In chemical examinations, however, the same amount of attention is not always given to methods of sampling, types of containers and so forth. Since the results of chemical examinations may be used as evidence in court actions where penalties may result, it seems that there should be prescribed details equivalent to those required for bacteriological examinations. It has been my experience in many cases to find that no apparent thought is given to the type of container which is best suited to keep samples of food in their original state prior to analysis.

It is the purpose of this article to point out, both from the legal and control points of view, some of the dangers involved in holding butter, cheese, ice cream and similar moist or fatty foods in containers other than glass, pending analysis. Specimens that are collected as evidence to be used in criminal actions should also be sealed in an appropriate manner, rather than by ordinary gummed-paper stickers often miscalled seals.

In official food inspection, the practice prevails for an inspector in taking a sample to leave a duplicate specimen with the dealer wherever practicable. Since the analysis of this inspector's sample is, in the majority of cases, the sole evidence on which a criminal prosecution is based, it is only fair and proper to give the dealer an opportunity to have a similar sample analyzed as a defense measure in case of prosecution either for adulteration or contamination. It is within the possibility of human error that the sample may be inadvertently changed, or that there may actually be a difference in results of analyses made by two qualified chemists because of some local or peculiar condition. Differences in results have occurred in the past and undoubtedly will occur in the future, and the defendant is entitled to the benefit of any doubt from such differences.

SOME OFFICIAL AGENCIES have adopted the practice of placing ice cream, butter and cream-cheese samples in paper, paraffined paper, cardboard or similar containers and then "sealing" them with a strip of gummed paper. A duplicate sample taken and sealed in the same manner is left with the dealer or storekeeper. Occasionally, it may be impossible or inconvenient for the person from whom the sample is taken to bring his specimen to a laboratory until a day or two, sometimes a week or more, after the sample was taken. During that time, the sample may have been kept in a warm or damp place, or the weather may be sultry. The paper seal may have become loosened from the container, or it may have been purposely taken off and the sample consequently rendered useless for laboratory purposes. I have found that, in warm weather, cartons and other types of paper-wrapped samples containing butter or cheese are received in this laboratory soaked with fat or water. And if the specimen is ice cream, the container will be soggy and loaded with moisture. It can readily be seen that results obtained through analysis of specimens kept under such conditions cannot be accurate.

One must not forget that samples of butter, ice cream or cheese are taken from storekeepers or small dealers who are not technically trained and who are not familiar with the correct manner of guarding samples until they are taken to a laboratory. It must also be borne in mind that ice cream samples, if kept at below freezing temperatures, will accumulate moisture or frost on the outside of the container. When this frosted container is placed under laboratory conditions, the moisture is absorbed into the carton or through the seams of the container. As a matter of fact, many things may happen to a sample that is kept in unsuitable containers.

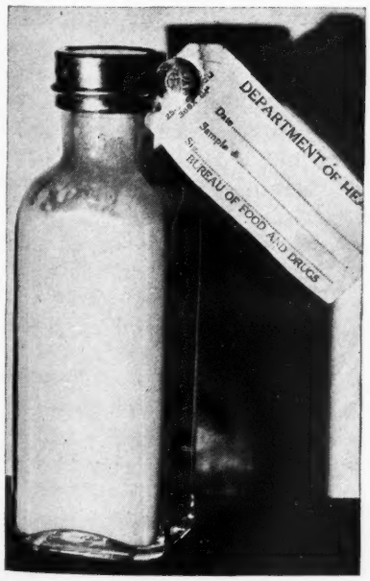
Some years ago, it was found necessary by the New York City Health Department to change its method of sealing milk and cream sample bottles because of the possibility of tampering with paper seals. It can therefore be seen that it should be necessary to take every precaution in order to make reasonably sure

Used for Food Samples

By CHARLES PALEY
Shirley W. Wynne Public Health Laboratories, New York, N. Y.

Proper containers for samples of ice cream, cheese, butter and other foods. These glass jars are secured against tampering by a sealing-wax seal. The wax also holds the identification tag.

that the sample remains in its original state until the seal is broken by the chemist immediately before analysis. The precautions include an impermeable container for fatty or moist substances and a reasonably foolproof seal for all specimens. Adulteration of butter, cheese and other food-stuffs is just as much a violation of the law as the adulteration of milk, cream or condensed milk. Samples of these products require as much protection.



Correct container for milk samples. The closure is held in place by a metal band secured with a lead seal. The seal also holds the identification tag. The glass container keeps the sample in good condition, while the seal prevents tampering.

The statement has been made by some officials that water may be lost from the sample when paper containers are used, this being to the advantage of the person from whom the sample was taken since the material becomes concentrated. This may be true, but it is also true that water might be introduced into the sample container through the seams. In either event, the sample is rendered worthless, and protection due to dealer and consumer alike is nullified. Small samples are generally taken, and it is only necessary for a small amount of water or other material to be introduced into, or subtracted from, a sample to make a great difference in the results of analysis.

Ice cream, after being melted, is as liquid as cream. Therefore, I can see no reason why glass containers should not be used for any liquid where the subtraction or addition of any integral part of the specimen would affect the analysis. In addition, the cartons or paper containers almost always become moistened and the seals become so loose that the cover can be removed very readily without breaking them. It is possible then to substitute other material for the product that was taken by the inspector. The cover can then be replaced with the seal. Since a duplicate sample is left with the dealer, this duplicate may be kept under different conditions than the sample which the inspector takes with him. These conditions may alter the character of the dealer's sample. If the dealer's sample, when it is submitted to the laboratory of a commercial chemist, is changed in composition, its purpose is defeated. When samples taken by official agencies are submitted to our laboratory, we often find the contents to be very concentrated, in some cases almost dried out, yet the paper seal appears to be intact. Since we do not know the condition of the material when sampled, we have no other choice but to make the analysis and report our findings.

It is understood that chemists work with small amounts of materials and, due to natural consequences, slight variations often will occur between the findings of two chemists working independently of each other. It should therefore be the duty of official agencies to take all necessary precautions in the sampling of foods in order to avoid conditions that may cause greater than ordinary variations in analytical results. In addition, such agencies should safeguard the interests of laboratory workers and others who handle these samples.

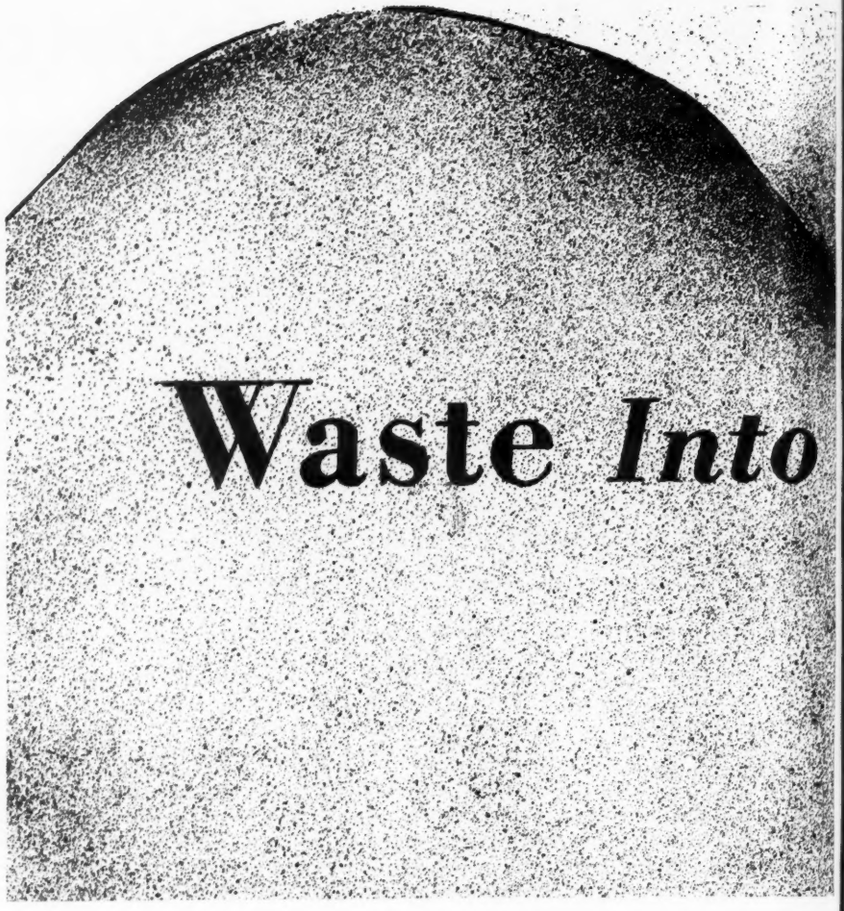
IN WORK OF AN OFFICIAL NATURE, where a person may suffer damage both to his reputation and to his pocketbook, samples should be taken in the fairest way possible.

Whether or not court action is contemplated, glass sampling bottles should be used exclusively for moist or fatty foods. These bottles should be secured against tampering, either with a wax seal or by a metal ring fitted around the neck of the bottle and secured by a lead seal. In either case, the seal should also secure the tag. It should not be possible to tamper with the contents of the bottle or to remove the identification tag without irreparably destroying the seal.

The same precautions taken by officials in sampling foods should be observed by the manufacturer himself when duplicate specimens are submitted to different analysts. Otherwise, the results of the analyses will be neither accurate nor dependable.

Shells, hulls, fibers and other wastes of food processing operations, instead of piling up dispoal costs, can become a source of profit to the plant by the exercise of a little engineering ingenuity

By **WADE W. MOSS**
Food Engineer, New York, N. Y.



Waste Into

MOUNTAINS OF PEANUT SHELLS stood in the yard of a large plant where peanuts were processed. Years ago, there was only a small pile. It grew to a hill—to several hills. And still the shells were blown out into the yard from the shellers. The hills became mountains.

There was no market value to the shells. They could not even be given away. It cost more to remove them than they were worth. But they could not remain, as they were a serious fire risk, and unsanitary. Above all, they made a bad impression upon visitors to the plant.

In desperation, we shoveled the shells into the boilers.

This got rid of the nuisance, and also lowered the plant's fuel bill. But it created a second problem—now there was too much steam!

Two boilers, fired to capacity, could scarcely consume the ever-growing piles of shells. As fuel, the shells have half the heating value of coal. And when the boilers were fired at a rate sufficient to use up the shells as produced, so much heat was released that the pop-off valves spouted geysers of excess steam.

Even at peak load, when all the steam using operations in the plant were going full tilt, the quantity of steam made available by burning the shells in the boilers far exceeded the demand. When all of the steam-using operations were working at the same time, including pasteurization of peanut butter, panning of sugared peanuts, refining and deodorizing coconut oil, and live steam sterilization of plant and equipment, there was still too much steam.

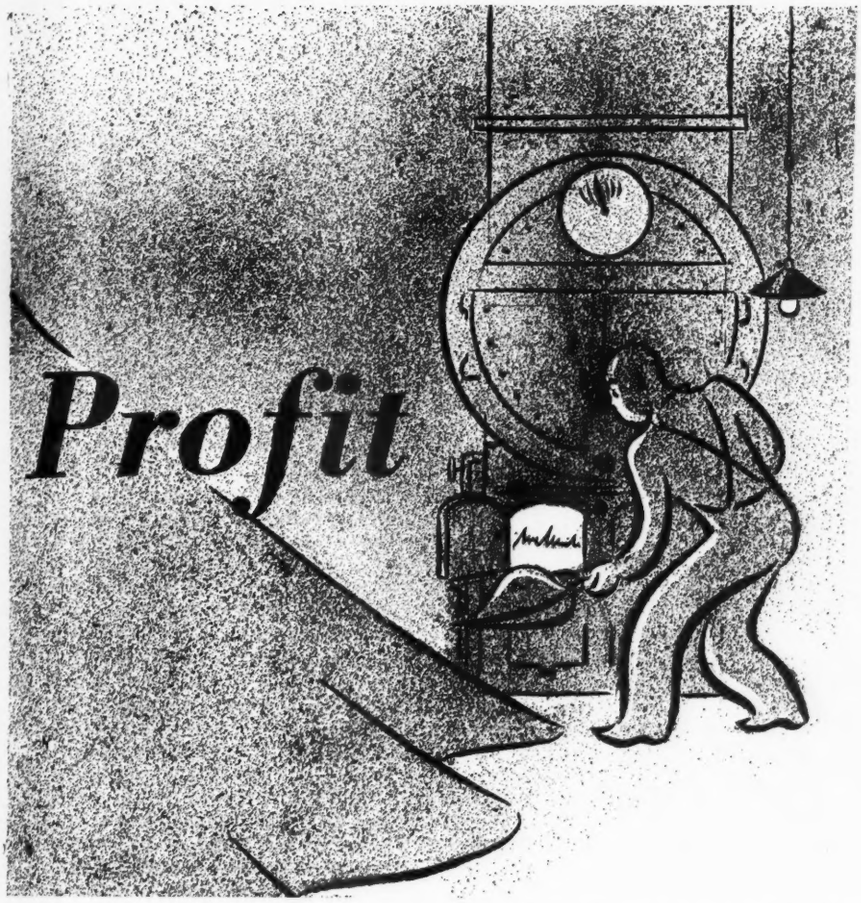
Steam uses were sought so that this excess of heat and steam could be put to some profitable purpose. One thing considered was the use of a steam jet evactor to draw a very high vacuum. The problem was to find uses for high vacuum.

The first use thought of was high vacuum oil deodorization. Another use for the steam jet evactor was in producing chilling temperatures and refrigeration. Uses for refrigeration were found in the chocolate room and storage room, and in the production of chilled water for cooling the candy tables.

STEAM JET EVACTORS are simple devices with no moving parts. Operation results from passing low-pressure steam through a Venturi nozzle. There, the area available for steam passage is first restricted and then expands to an area greater than that of the steam inlet pipe. The sudden expansion of the steam passing through causes a rapid drop in pressure, producing a high vacuum. This vacuum can be used direct in processes, or as an aid in evaporating, drying or distilling. When applied to water, this high vacuum causes rapid evaporation and chilling. The water can then be used for cooling products or for refrigerating purposes.

The velocity of the steam jets, with steam at 100 lb. gage pressure, is around 4,000 ft. per second. For some purposes this gives an advantage over a mechanically developed vacuum. For evaporative chilling of water to 40 deg. F., a vacuum of 29.75 in. is required. At this vacuum, each pound of water evaporated occupies a volume of 2,440 cu.ft. Therefore, for any substantial cooling capacity, the volume of vapor to be handled is large. That is what makes the high velocity of the steam jet a decided advantage. Large volumes of vapor are entrained at the high velocity and can be handled in moderate sized equipment. In contrast, the limitation on the speed of a mechanical vacuum pump would require very large pump capacity for the same amount of cooling.

Deodorization of refined coconut oil with the steam jet evactor proved economical. Also, the process was speeded up and the product was improved. On a 1,000-gal. batch of the oil, the amount of scrubbing steam injected into the bottom of the deodorizer was 900 lb. in a three-



▶ ***Burnable wastes are a byproduct of the operation of many food processing plants. Before paying out good money to get rid of such wastes, the possibilities of using the material as boiler fuel should be investigated. Perhaps, as described in this article, enough uses for steam can be found in the plant to make this method profitable to processors of***

Fruits
Grains
Nuts
Vegetables

hour period. The evactor, which handled this steam at 29.5 in. of vacuum, had a 10-in. suction flange and an 8-in. discharge. In order to compress the vapor to a convenient point for condensing, 510 lb. per hour of live steam were used in the jets. A small steam jet was used on the condenser, which was of the counter-current barometric type. This jet handled air leakage and any non-condensible vapor brought over.

Success in the deodorizer application paved the way for the chilling and refrigeration operations.

The chocolate room, which measured 20x40 ft., contained, among other equipment, revolving pans for chocolate covered peanuts, and dipping apparatus. This room had a heavy cork insulation. A temperature of 40 deg. F. was maintained by means of an ammonia compressor. This compressor was unfortunately often out of service.

Refrigeration load for this room was calculated at 10 tons. The load included the heat from motors, chocolate cookers, lights and workers.

Study of this refrigeration requirement in relation to the refrigeration needs of the candy cooling tables and the storage room developed that it was economical in steam consumption to use several small units, rather than one large one. However, all other major considerations, such as cost of equipment, space required, installation expense, and flexibility of operation, favored one large unit to take care of all the cooling.

It may seem strange that one large unit should be more flexible than three small units. This is true only when the large unit is fitted with three steam jet boosters in parallel. Each of these must be, respectively, of proper capacity for one of the refrigeration requirements. A common vacuum chilling vessel, booster condenser, final evactor and chilled water pump were used. The different steam jet boosters were cut in or out as required. Since the condenser and final jet ran continuously, it was simpler to turn on one booster than to start up an entirely separate outfit.

Chocolates and such perishables as fruits were kept in the storage room. This was well insulated, and measured 20x60 ft. The temperature was kept at from 40 to 50 deg. F.

In operation, 60 gal. per minute of water were chilled to 34 deg. F. This was circulated first through finned cooling coils in the chocolate room, where the heat absorption, corresponding to 10 tons of refrigeration, raised the water temperature from 34 to 38 deg. F.

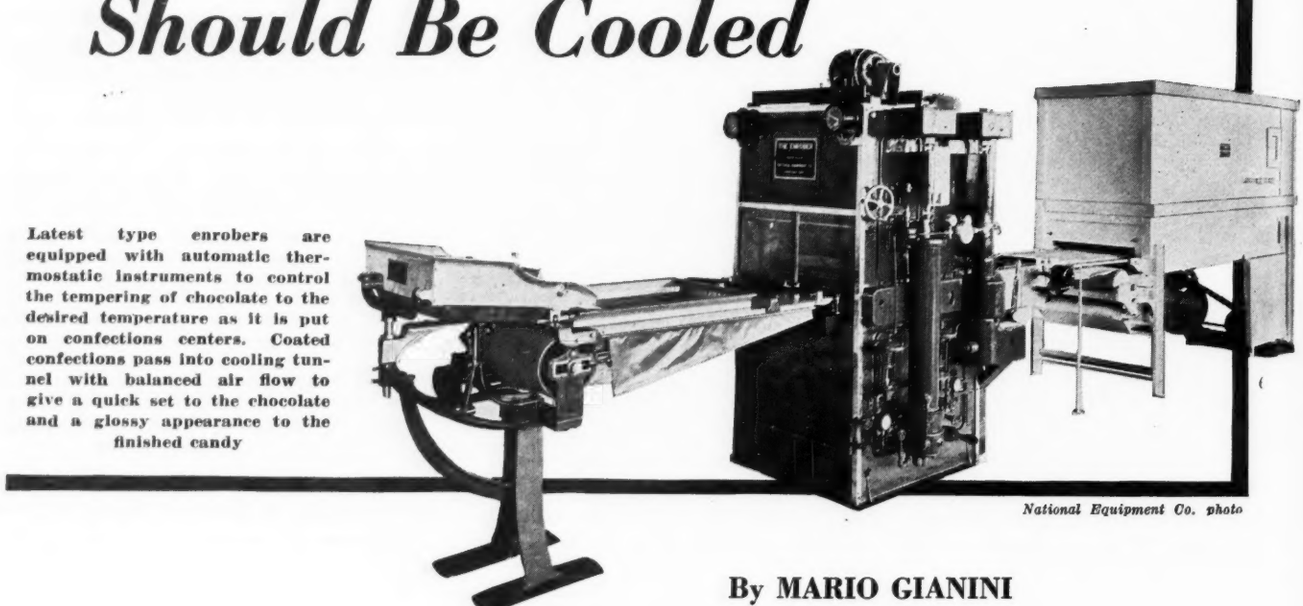
Next, the water was circulated through coils in the storage room. This raised its temperature from 38 to 42 deg. F. At this temperature the water flowed to the candy cooling tables. There the maximum temperature rise was about 3 deg. F.

Cooling of the candy tables was done by circulating the water in 1-in. pipes under the marble slab table tops. A number of these tables stood end to end, the water flowing in parallel to the different tables. Maximum refrigeration for these tables was calculated at 7.5 tons.

Refrigeration for the plant totaled 27.5 tons. Allowing 2.5 tons for losses and as a factor of safety, the rated capacity was 30 tons. To produce this required 1,250 lb. of steam per hour. This refrigeration could have been produced with less steam by means of vacuum refrigeration designed to produce chilled water at 40 or 45 deg. F. However, the extra steam was available at little extra cost and the advantages of 34 deg. F. water were appreciable.

In the ways described, by planned engineering, the abundance of 100 lb. steam was used. It was diverted from the pop-off valve to the efficient and economical operation of services previously carried out at considerable expense for electric current and labor, and requiring expensive machinery. Experience showed that even if the steam had been generated for these purposes alone, at an average cost of around 35 cents per thousand pounds, the use of the steam jet booster method would have been both more economical and efficient.

How Chocolate Coating *Should Be Cooled*



Latest type enrobers are equipped with automatic thermostatic instruments to control the tempering of chocolate to the desired temperature as it is put on confections centers. Coated confections pass into cooling tunnel with balanced air flow to give a quick set to the chocolate and a glossy appearance to the finished candy

National Equipment Co. photo

By MARIO GIANINI
New York, N. Y.

STREAKED, GREY, OR SPLOTCHY SURFACES identify chocolate-coated confections which have had the misfortune of encountering incorrect temperature or humidity conditions.

If objectionable surface appearances are to be avoided, at least three precautions have to be taken: 1. The chocolate as well as the centers must be at the right temperature when the coating is applied. 2. The coated confections have to be kept under the right temperature and humidity conditions until the chocolate layer has fully solidified or frozen. 3. The confections must be delivered to the packing table at the right temperature for packaging.

These precautions hold whether the coating is applied by dipping the center into the chocolate or by putting the chocolate on the center by manual or mechanical means.

To get the desired decorative and protective effects, the chocolate is applied so as to have a pleasingly glossy surface and to give an unbroken covering to the center. An important factor in getting these results is to have both the centers and the chocolate coating cooled to temperatures favorable to a quick setting or freezing of the chocolate. Best results are when centers have a temperature of 72-80 deg. F.

Chocolate does not harden or set at a definite temperature. Instead, it solidifies gradually as the various freezing temperatures of the several fats, of which cocoa butter is composed, are reached. This temperature range is between approximately 86 deg. F. for milk chocolate and up to 90 deg. F. for dark sweet chocolate coatings. There are various methods and mechanical means by which this cooling may be done. Best coating results are obtained and a considerable saving in cooling time and refrigeration expense are made if the chocolate is cooled to almost its setting or hardening temperature before it is applied to the centers and then subjected to solidifying temperatures.

IN THIS CONNECTION an important point must be kept in mind. Chocolate cannot be handled successfully for any great length of time while cooled nearly to setting temperatures. Hand dippers of chocolate-coated confections take advantage of this knowledge and do a first-class coating job because they cool down only enough chocolate to cover a few confection centers at a time. It is for this reason that enrobers—chocolate coating machines—are now built along different lines than formerly.

In the modern enrober the chocolate tank is designed like a melting kettle with scraper agitators that fit with mechanical precision at all points and set up a horizontal motion in the contents of the tank. They not only keep the walls of the tank free from chocolate accumulations but help to keep air bubbles out of the chocolate instead of beating them in. Another helpful detail in the construction of the modern enrober is the provision for drawing the melted chocolate from the lowest point in the enrober tank. This detail assures a free flow of the chocolate through and out of the enrober. From this point a water-jacketed pump forces the chocolate through a vertical water-jacketed tempering tube. Automatic thermostatic control instruments are fitted into the tempering system so far as to have their heat-sensitive elements in the flow of chocolate entering and leaving the tempering tube.

In the best practice the enrober is operated so that the contents of the chocolate tank are kept at 3 or 4 deg. F. above the temperature at which the chocolate is applied to the centers. When that practice is followed, the flow of the cooling water through the jacket of the tempering unit may be regulated through the

Based on a paper read before the Production Forum of the National Confectioners Association.

thermostat to have the chocolate at the desired coating temperature as it is discharged from the tempering unit into the "flow pan" or trough distributer. This device is suspended in the enrober immediately over the wire mesh conveyor which carries the centers to be coated. Adjustable slit openings in the "flow pan" permit the tempered chocolate to flow through in continuous thick or thin sheet-like streams, as desired, onto and over the centers as they pass through the enrober. The wire mesh conveyor gives free drainage of the surplus coating back into the enrober tank. When desired, the chocolate layer on the confection can be made less thick by the action of a regulatable air blast from a fan built into the top of the enrober and by the vibrating motion that may be imparted to the wire conveyor. The vibrating motion may be vigorous or gentle as desired and also serves to break up any air bubbles that may be trapped as the coating falls onto the centers.

In shaking off a portion of the chocolate layer the vibration of the conveyor causes a microscopically thin layer of cocoa butter to form on the surface of the chocolate-coated confection. As the confection passes off the wire mesh conveyor onto the solid-surfaced conveyor which runs into and through the cooling room or tunnel, the chocolate layer almost instantly solidifies or freezes. The film of fat on the surface becomes mirror-like and gives the confection its pleasing and appetite-stimulating appearance providing, of course, that the cooling room or tunnel is operated under the right temperature and humidity conditions.

When an enrober is equipped with the tempering unit and the automatic temperature-controlling instruments and is operated as described, machine-coated confections are produced under more nearly the hand-dipping conditions than has previously been the case. Until the modern enrober came into use, the hand dipper operated at 2 to 4 deg. F. lower temperature than it was possible to get in machine coating and the appearance of the finished confections was in favor of hand-dipped ones.

That perhaps is the reason that the confection-consuming public has given preference to hand-dipped chocolate confections. This preference has persisted in spite of the 30 to 35 years of effort on the part of the confectionery manufacturers to get machine-coated confections accepted on an equal basis with hand-dipped confections. Now that the enrobers can be operated at hand-dipping temperatures and coating layers of almost any thickness can be put on the centers there is no longer the marked differences between the machine-coated and the hand-dipped confections. Machine-coated confections can also be given the strings or top markings that were so characteristic of hand-dipped confections until the past few years.

THE COOLING TUNNEL or room plays a very important part in finishing of chocolate-coated confections.

Experience has definitely proved that slow-cooling of the coated confection is superior to fast cooling. However, lack of space has made slow cooling impossible in many plants.

To this end new cooling units have been designed which have proved quite satisfactory when operated at fairly high speeds. This higher operating rate has been made possible by having sufficiently large ducts for air circulation, good insulation without leakage, an abundance of cooling coils, and a means for drying the air to prevent moisture being deposited on the confections during cooling.

The new cooling tunnels are built with a generous amount of asbestos insulating material and cement to make them fireproof, waterproof and verminproof. At the inlet end of the tunnel is mounted a bunker containing fin-type cooling coils. A motor-driven fan draws air through the coils, blows it the entire length of the box in a duct above but not in contact with the confections. The air traveling through this duct rises slightly in temperature which causes it to expand and lower its relative humidity. At the delivery end of the tunnel the air is picked up by another motor-driven blower and is forced over the goods in a direction opposite to the travel of the loaded conveyor. The air completes its circuit by returning to the cooling coils at the feed end of the tunnel.

Proper adjustment of the blowers balances the air flow. When that is done there is no loss of cooled air at either end of the tunnel nor is any moist outside air sucked in. Wings or baffles are provided at suitable intervals to throw the air back and forth under the conveyor belt so as to cool properly the bottoms of the confections.

In the making of chocolate-coated confections the cooling equipment is the neck of the bottle so far as the rate of production on an enrober is concerned. For that reason no cooling tunnel is ever too long; the possible speed of an enrober is in direct proportion to the length of the cooling tunnel.

SATISFACTORY RESULTS are obtained with a 40-ft. tunnel when it is running at a speed of 8 ft. per minute (five minutes cooling time). Faster speeds are claimed by some users; everything depends on the meaning of the word "satisfactory." To cool a load of coated confectionery in five minutes the air circulated through the tunnel would have to be at a temperature of 45 deg. F. and should be circulated at the rate of from 1,000 to 1,500 cu.ft. per minute when used with a 24-in. enrober and centers cooled to approximately 72 deg. F. An excellent quality of high-grade work is obtained in a cooling time of fifteen minutes with air at 50 to 54 deg. F. and centers at 78 to 80 deg. F. But sometimes confectionery manufacturers just cannot find sufficient space for a long enough tunnel to provide a fifteen-minute cooling period.

Many times, the available floor space for an enrober set-up is entirely inadequate for a cooling tunnel and a packing table. There are two solutions to this problem: one is

(*Turn to page 224*)

▶ ***Chocolate coatings must be handled under controlled atmosphere conditions during parts of the processing in order that the finished goods shall have an attractive appearance. This article describes methods used in the manufacture of confectionery to avoid streaked, gray or splotchy chocolate coatings, methods useful in the manufacture of***

Bakery Products
Chocolate Products
Coated Confections
Ice Cream Bars

The CHAINS Are Going *SUPER*

SUPERMARKETS WERE DEPRESSION BABIES, but, contrary to predictions, were not born anemic, doomed to pass away with the advent of better times. In fact, the super has proved robust and tenacious. Today it is an accepted pattern in the economic design. Its position is further solidified by imitators of part if not all its merchandising methods.

Corporate chain stores have changed their method of merchandising but little in the last decade beyond accentuating their policies of buying at bedrock and offering price appeal on a limited number of rapid turnover items in stores that, so far as possible, are uniform inside as well as outside. The chains now appear to be going through the throes of rebirth. Many of the new breed have chipped their shells and emerged.

In spite of predictions and legislative attempts to uproot the cut-throat outlets, the supermarkets have flourished and in fact have corralled an estimated 15 per cent of the country's retail food market. In industrial centers particularly, the supermarket has been deadly competition. It has made inroads into many markets. It has weaned customers from all outlets throughout its enormous trading area. Price is the super's major inducement; therefore it has fattened largely at the expense of the corporate chain. At last the corporates admit the competition. Now they are fighting back. In California, a hothouse that has nurtured an ever-increasing crop of supers, Safeway is attempting to meet the prolific aggressors by replacing more than 250 of its smaller units and more than 70 Piggly Wiggly units by large department-store types of supermarkets. Kroger is experimenting. So are other corporates. A. & P. is going Piggly Wiggly.

A measure of the heat of the chain-versus-super conflict is revealed by A. & P.'s present complicated and apparently inconsistent operating methods. At Buffalo, in the center of a nest of her own regular stores, A. & P. has opened a "Master Market," which offers drastic cut-rate price competition to all A. & P. stores in the Buffalo area.

The Beautiful New A&P
SUPER MARKET
1635 McFARLAND ROAD
Mt. Lebanon, Pa.
WILL OPEN TONIGHT
The General Public is invited to inspect this new and revolutionary idea of food merchandising. There are two floors of fine quality foods laid out for complete self service with displays attractively placed within easy reach, giving a maximum of finger-tip convenience in shopping.
AMPLE FREE PARKING SPACE
The large free parking space surrounding this new market and the new "Open Evenings" policy allowing the housewife to do her shopping in the coolness of the evening should prove a double incentive to thrifty shoppers to make this store their headquarters for "Everything Good to Eat."
OPEN EVERY EVENING UNTIL 10:00 P. M.
A & P FOOD STORES

In the same Buffalo newspaper on succeeding days appears the advertisement of A. & P. regular stores and the A. & P. Piggly Wiggly self-service Master Market. Although the Master Market prices cut deeply below regular A. & P. store prices, introduce a new and formidable competition, it is welcomed competition. At least, it appears to be so, because A. & P.'s regular advertisements suggest to their regular customers the savings to be obtained through purchases in the Master Market rather than the regular A. & P. stores. This is true enough. The advertised prices for both types of stores certainly offer an interesting comparison, especially to those who know cost prices.

The A. & P. type supers are located in neighborhoods higher in living standard than those in which supers are usually found. In Pittsburgh, the A. & P. supers are in or border the choice middle class and up neighborhoods. "Streamline" supers, largely responsible for goading A. & P. into adopting super market distribution in Pittsburgh, are more typical of the run-of-mill supers. They are located nearer the industrial districts.

A. & P.'s Pittsburgh retaliation to "Streamline" inroads closely parallels Buffalo tactics. These three self-service A. & P.'s in Pittsburgh bear many super earmarks—low prices, self-service, perambulators, multiple items, mass displays, large floor space and often parking facilities.

Aside from the unique situation of wide margin competition between A. & P. stores in the same neighborhood, even in the same block, there is another angle noteworthy in the light of recent happenings.

A. & P.'s historic New Orleans handbill comparisons of "to the Consumer" costs of national brands with their own distributor brands (refer to *F. I.* Feb. 1937, page 93), is not likely to be repeated in the locality of A. & P. Master Markets. Many national brand prices have been cut in Master Market advertisements far below the prices quoted in the New Orleans handbills. A. & P. distributor brands have suffered less. Can there be less margin in these distributor brands? At any rate the gap between the two has definitely narrowed. Chase & Sanborn coffee has been quoted in Buffalo at 21 cents per pound can, in the same advertisement with Bokar coffee quoted at two 1-lb. cans for 45 cents. Possibly A. & P. guarantees *better* quality for distributor brands in Master Market cities.

This battle for survival and supremacy in the distribution field should be more than merely interesting to the food manufacturer. In this game, the move of every pawn and piece deserves rigid scrutiny. Certainly the manufacturer who sees ahead to the checkmate in this distribution conflict has the competitive advantage in his struggle for survival.

These A. & P. Prices Appeared in Buffalo Newspaper Advertisements on Succeeding Days of January, 1937.

	A. & P. Food Store Prices	A. & P. Master Market Prices
Gold Medal Flour—24½ lb. sacks	$1.10	$1.05
Jell'O Royal 4 pkgs.	.23	.19
Heinz Ketchup large bot.	.19	.17
Crisco 3 lb.	.59	.53
Leg of Lamb per lb.	.22	Leg O'Lamb .17
Chuck Roast per lb.	.17	.12

Comparative Prices—A. & P. "New Orleans Hand Bill" and Buffalo Master Market Newspaper Advertisements.

	New Orleans Hand Bill Prices		*Buffalo Master Market Prices*
Heinz Ketchup	23¢		16¢
Jell'O or Royal	5½¢	4 for	19¢
Campbells Beans	8¢		6¢
Pet Milk	7½¢		7¢
Kellogs Corn Flakes.	13¢		10¢
Kellogs Corn Flakes.	—	Two small	13¢

What Controlled Atmosphere *Does* *in the Margarin Plant*

Filtering to remove organisms betters quality. Regulation of temperature and humidity improves handling

By H. W. VAHLTEICH
Edgewater, N. J.

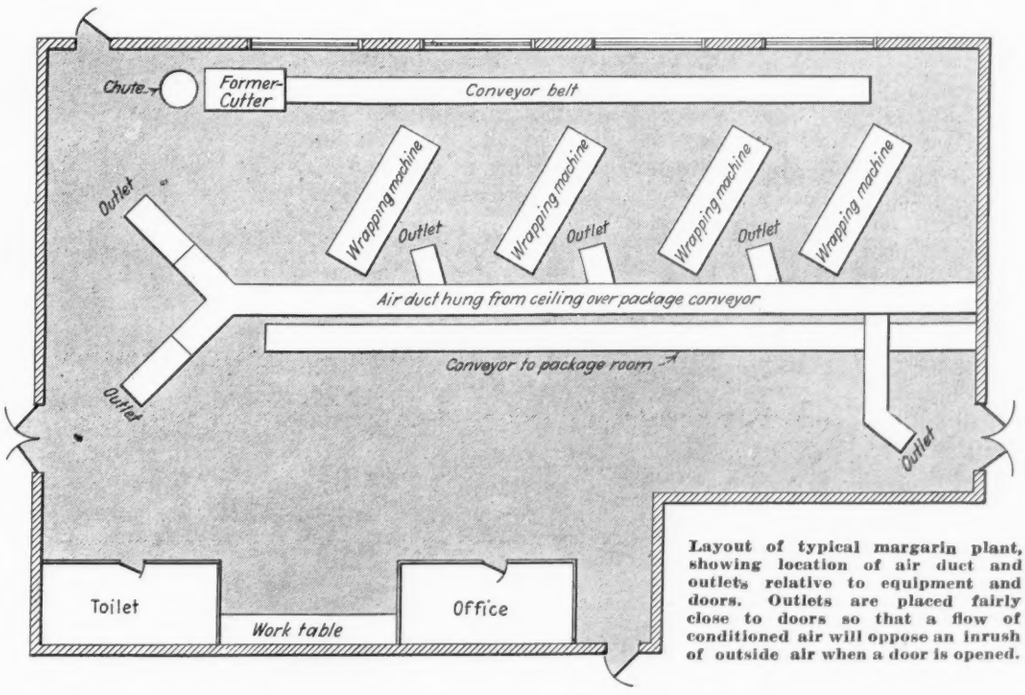
TWO ADVANTAGES IN PARTICULAR are gained by the control of the atmosphere in a plant manufacturing margarin. Both have a favorable influence on quality. One is the improvement in the keeping quality of the finished product. This advantage is gained by eliminating the molds and bacteria normally present in the air we breath. They blow around like dust. The other advantage is gained by the control of temperature and humidity. When this is done, a difficulty in handling the material in process may be eliminated, particularly on hot humid days.

Of these two advantages, the first is undoubtedly the most important, and it is attainable with less effort and expense than the second. Filtration of air to eliminate air-borne molds and bacteria is comparatively simple and involves no control of temperature nor of humidity. An air-intake fan and a duct system for conveying the air to the various parts of the building are essential.

While the incoming air is filtered, and while the location of the opening of the incoming air duct should be selected with care, the important points of air filtration are at the outlet openings of the ducts. Each outlet is fitted with a suitable air filter. Several types of "wools" are used successfully as filters (steel wool, glass wool, hair and so forth). These are impregnated with mineral oil or other material suitable for capturing micro-organisms, yet permitting the filtered air to pass through. These wools usually are prepared and mounted in frames at the outlet ends of the air ducts so that they may be removed readily for periodic cleaning and replaced by fresh frames.

There are a large number of air-borne organisms, molds, yeasts, bacteria and so forth which, ordinarily harmless to man, have the ability to split fats (tri-glycerides) into glycerin and fatty acids. Among the common ones may be mentioned the various *Aspergillae* and *Oidia* which, when visible to the naked eye, are seen as spots or colonies usually green, black or white. Their activity may develop in margarin fats con-

(*Turn to page 225*)



Layout of typical margarin plant, showing location of air duct and outlets relative to equipment and doors. Outlets are placed fairly close to doors so that a flow of conditioned air will oppose an inrush of outside air when a door is opened.

Armour Prevents Accidents

Six plants operate ten months without single lost-time accident

By W. F. McCLELLAN
General Safety Supervisor, Armour & Co., Chicago, Ill.

EIGHT AND ONE-HALF MILLION man-hours without a lost-time accident. That is a record made by six plants of Armour & Co. over a period of ten months. In February, these six plants were tied for safety honors in an annual safety campaign which began last May. And the safety record of several of the plants antedates by many months the beginning of the campaign in May. This is abundant evidence that accident prevention is worth the time and effort involved.

The significance of this safety record becomes apparent when it is considered that the packing business presents about as many accident hazards as any large industry. About 70 per cent of our employees use knives or other sharp cutting tools. We also have maintenance units whose work involves many hazards. So altogether, our problem of reducing accidents is a big one.

The measures by which accidents are minimized in more than a score of Armour packing plants have been developed over a period extending from the days of the World War. The high production demand at that time brought into our plants thousands of inexperienced workers. With this came a notable increase in the number of accidents. So Armour decided that from both a humanitarian standpoint and as a cold business necessity something definite had to be done to curtail the number of accidents.

The first step was made in the Chicago plant and the initial considerations had to do with the physical layout of departments. Special attention was given to the lighting. Then came various protective devices for machinery. Whirling saws and open gears were covered. Next came a campaign of safety education among the workers. This latter we considered a most important step, and safety education is still a policy to which the company adheres. Experience proves that *"the best safety device is a careful man."*

The process of educating the workers began through meetings with the supervisory staff, and this was about as difficult as it was to impress safe practice on the average worker. The supervisors had inherited the idea that personal safety was the personal responsibility of each individual employee. A plant newspaper was published through which we presented safety lessons in story and picture, and posters and slogans made their appearance. A social club was established for the plant supervisory staff. Entertainment at the club meetings insured a good attendance, but no meeting was complete without an interesting and instructive safety and accident-prevention talk. The supervisors forgot their indifference to accident prevention and became enthusiastic. Contests were conducted between divisions and departments, trophies and banners being awarded to the groups having the least number of accidents over a given period of time.

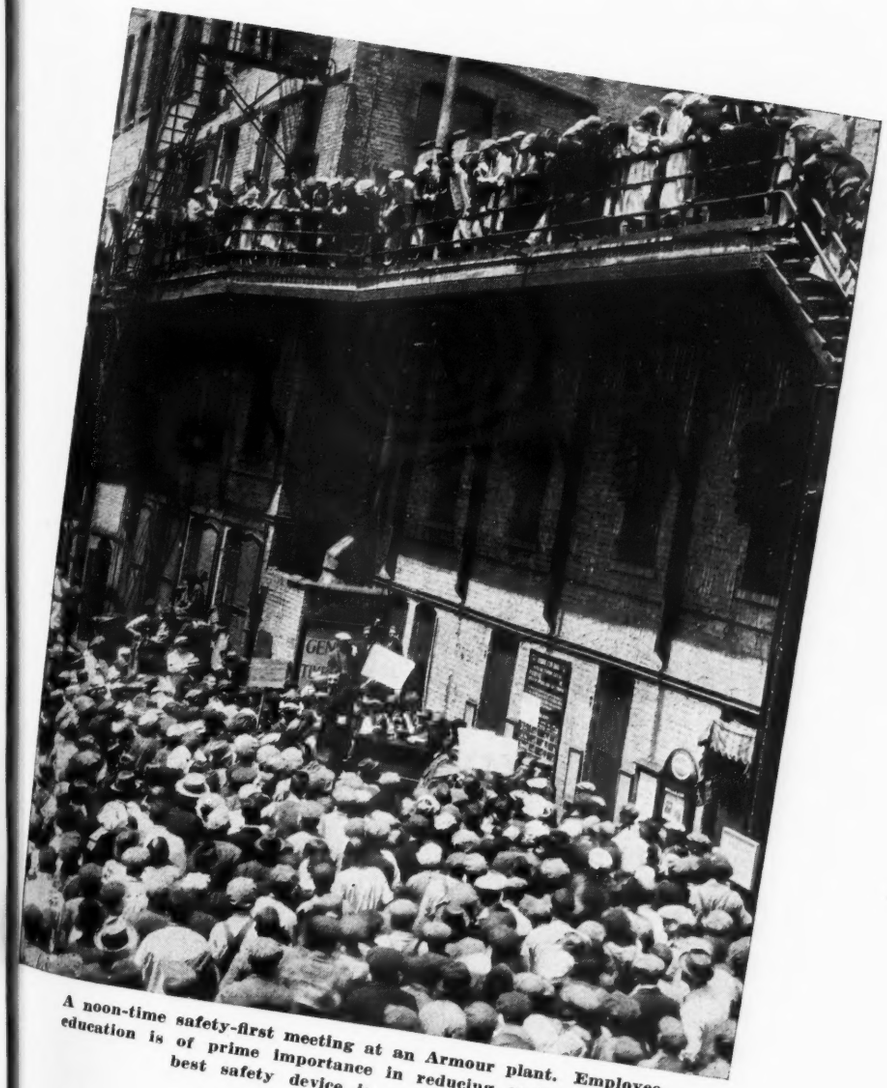
No opportunity was overlooked, either by word or in print, to impress upon the workers the importance of avoiding accidents, not only for the financial loss involved but also for the suffering entailed and the possibility of permanent disability from untreated minor injuries. Particular stress was laid on the importance of obtaining prompt attention to all cuts and bruises, no matter how trifling they seemed to be. It might, incidentally, be mentioned here, that one of our first steps taken after the organized safety plan was put into effect was the establishment of a medical department and the discarding of departmental first-aid kits. The

This pair of goggles saved the eye of a maintenance man.

It's a long, hard fall from the top of a freight car to the tracks. So danger signs are used where cars are separated at the loading platform.

▶ ***For economic as well as humanitarian reasons, safety for plant workers is important to manufacturers. How such safety has been attained in an industry with many hazards is described in this article. It has a practical value for***

All Food Manufacturers



A noon-time safety-first meeting at an Armour plant. Employee education is of prime importance in reducing accidents. "The best safety device is a careful man."

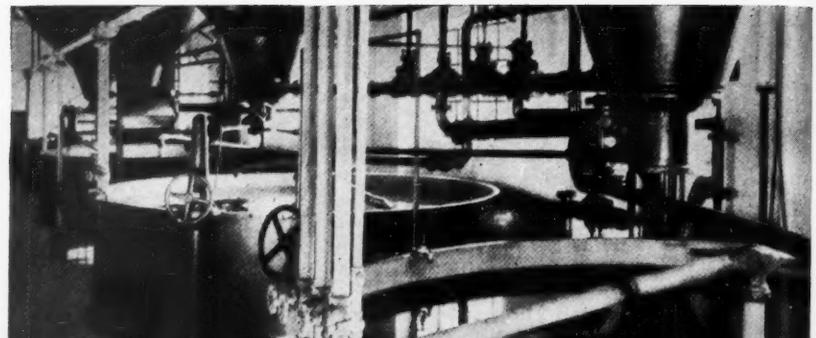
work was unceasing and conditions began to improve at once.

The work of impressing safety consciousness on the employees in our Chicago plant was maintained, and conditions continued to improve. Then the safety movement was extended to our other packing plants, following the same plan as in Chicago. Interplant safety contests were arranged, and through meetings, posters, bulletin boards and the plant publication, employees in the various plants were keyed up to a high competitive spirit to make the best safety record over a period of one week. Later, these safety campaigns were extended to two weeks time and eventually to periods of one month's duration.

In the beginning of these contests, every visit to the doctor's office was counted as an accident, no matter how slight the injury. We eventually found, however, that some foremen and some employees, in their efforts to make a good showing, were reluctant to obtain medical treatment for what they considered insignificant injuries. The great danger from these "insignificant injuries" was the possibility of infection. The rules of the interplant safety campaign were changed, and now only lost-time accidents are counted, so that we have been much more successful in obtaining the full cooperation from the supervisors and the workers. Incidentally, our insistence on prompt attention to slight injuries has greatly reduced the number of lost-time accidents due to infections from injuries.

Through the Armour plan of employee representation, we have received valuable cooperation in the prevention of accidents. A standing committee of elected representatives makes regular and systematic plant inspections out of which come recommendations for the elimination of accident hazards. An accident review board, composed equally of employee and management representatives, sits as a court of inquiry on every accident of any consequence which occurs in the plant. The injured employee, his foreman and witnesses are called and required to give their versions on how and why the accident happened. The board fixes the responsibility for the accident and reports its recommendations to the plant superintendent. Then steps are taken to prevent recurrence of that particular type of accident. We feel that there is a psychological benefit to all who attend these meetings, for they naturally are impressed that accident prevention is a serious business with Armour & Co.

In the years since the War period, great strides have been made in accident prevention through the adoption of safety devices. Employees themselves have made many worth-while suggestions along these lines. Safety guards for knives and other sharp tools, rubber boots with antislip soles and heels, hats with hard-fiber crowns for the prevention of head injuries from falling objects, shoes with reinforced toes which can stand tremendous pressure without damage to the workers' feet, wrist guards, leather aprons, wire-mesh gloves to be worn on the hand opposite to the one in which the knife is held—all these have been helpful in reducing the number of injuries in the packing plants of Armour & Co.



Malt steeping is carried out in large open vats or tubs fitted with sweeping, slow-moving agitators

MALT STEEPING

Cold Water Versus Hot Alkaline Methods

By **THEODORE MARKOVITZ**
South Orange, N. J.

ATTEMPTS TO INTRODUCE hot alkaline steeping of grain for malting into this country during the past few years has led to an investigation of the method by R. Neugebauer, a German chemist.

The alkaline hot steeping process originated in Germany during the World War as a substitute for the standard method. It made possible the use of inferior barley and resulted in the production of a thin, low-grade, young beer which had to be consumed in a short time before it deteriorated. Another result was that the taste of husks was noticeable.

The modern American brewer, who uses only the choicest raw materials, does not have to depend upon makeshift or substitute methods to improve his beer. Properly malted grain and correctly controlled fermentation and aging will always give a superior beer.

Steeping of grain for malting is a problem which has to be solved by each maltster according to the variety of barley he uses. It is usually carried out in cold water. Windish recommended steeping in warm water up to 85 deg. F. Somlo uses the higher temperature of 130 deg. F. which is quite high and may impair the germinating power of the grain.

Degree of steeping depends upon: 1, the condition of the barley; 2, kind of water, (hard or soft) used; 3, room temperature; and 4, time of steeping. Addition of milk of lime to the water when steeping barley in the cold has been recommended because a hard water is generally preferred. In the hot alkaline steeping method addition of a strong alkali such as sodium hydroxide or potassium hydroxide, or both, is specified. The alkalies are added in variable quantities to remove undesirable constituents contained in the husk. These constituents termed "testine bodies" by Moufang, according to sponsors of the hot steeping method, impart a disagreeable taste to the beer.

On the one hand, removal of the testine bodies is not desirable. On the other hand, removal might be useful depending upon whether the natural or artificial aging process is used. For standard brewing and fermenting with natural aging, a hot alkaline treament of the barley at 104 deg. F. to 120 deg. F. is entirely unnecessary and out of place. During normal aging, all undesirable taste and smell of the young beer is removed. This conclusion is supported by the fact that a large number of beers produced by cold steeping have become famous the world over. In beers which are artificially aged, the removal of the testine bodies from the barley can be a beneficial factor under certain circumstances.

CONSTITUENTS of the husks supposedly removed by the alkaline treatment are not entirely objectionable in the fermenting and aging processes. For instance, the coloring matter is important as a protective colloid. The tannins play a very definite part in the complicated chemical changes which take place during fermentation and aging. One object of this article is to indicate to what degree the husks, also the inner part of the grain, are attacked or destroyed during the hot alkaline steeping.

In connection with Neugebauer's investigation, attention has to be called to claims that a difference must be made between barley with coarse husks and with fine husks. These claims maintain that with the coarse husks, the alkalinity of the steeping solution must naturally be greater than with the fine husks, because the coarse husks contain a larger quantity of undesirable compounds. This view is erroneous and lacks the perception that alkaline steeping, especially at temperatures from 104 to 120 deg. F., attacks not only the husks but also the inner part of the grain.

The testa does not cover the grain completely. It leaves a small opening at the base through which the dissolved compounds are allowed to pass.[1] Through this small opening the steeping water penetrates into the interior of the grain and attacks the grain in an undesirable manner. Unfavorable action of alkalies on the albumen of the barley takes place. When subjected to alkalies, albumen decomposes and finally precipitates as a dark sediment in the beer after bot-

tling. This sediment is a denatured protein, an alkaline albuminous matter which has been permanently changed. In this way, the keeping qualities of beers prepared from alkaline treated barley are lowered. The result is that the consuming public has not taken favorably to beers of such character.

During the four to six weeks storage period of the malt this denatured albuminous matter is not readily acted upon by the enzymes which split the proteins not changed to alkaline albuminates. A thin tasting beer with little or no foam results. It has been observed that barleys low in albumen are damaged much easier by alkalies and high temperatures than barleys which have a high albumen content. If this is so, no difference in steeping procedure should be made between barleys with coarse husks and those with fine husks. The degree of the alkalinity should be governed by the action of the steeping water upon the interior of the grain. Laboratory malting test is essential.

The alkaline steeping water penetrates into the interior of the grain not only through the opening of the testa at the base of the grain but also through the various cracks and holes in the surface of the husk. A. J. Brown has proved that during tests with uninjured grains a total of 98 per cent of extractive matter was obtained with normal steeping. The husks yielded 36 per cent and the interior of the grain gave 62 per cent. These results show the inferiority of the alkaline hot steeping process. In this connection it is important to observe that the tannins contained in the husks are dispersed into a highly colloidal state by the alkaline steeping water. Later on in the course of the washing operations they have a chance to go more readily into solution especially as the steeping is never brought to completion.[2, 3]

Also, it has been observed that hot alkaline steeping materially lowers the germinating rate of the barley. That means the higher the temperature and the higher the alkalinity, the greater the reduction in germinating properties of the barley. A temperature of 104 deg. F. and an alkalinity of 0.2 to 0.3 per cent NaOH gives a yield of only 60 per cent of germinated grain even for the finest barley. In other words, 40 per cent of the kernels did not germinate. Even at lower temperatures of 68 to 80 deg. F. and an alkalinity of only 0.1 per cent NaOH, a very slow germination resulted during the first days. Also a longer flooring period, 1½ to 2½ days, was needed and a lower yield and shorter grown sprouts resulted. (See Tables I to VI giving results of tests made on alkali-steeped barley.)

The appearance of the malt produced by the hot alkaline steeping method is considerably impaired. In comparison with the clear light color of a good normal product, it is gray and inferior looking. A further disadvantage shows up in the changed physical nature of the husk, which cracks and splits during kiln-drying. These deformed husks make the drawing-off operation much more difficult. This disadvantage alone is a weighty argument against the hot alkaline steeping. Moreover, the yields are reduced, as can be seen from the table. When all these disadvantages are considered one can conclude that the hot alkaline steeping process is costly and that it gives an inferior product.

Table I—Alkali-Steeping Procedure for Barley to be given Laboratory Germination Test.

Test No.	Time of alkali steeping in hours	Temperature Deg. F.	Addition of KOH per ct.	Addition of Na OH per ct.	Steeping hours	Couching hours
1	2	105	0.30		62	14
2	2	105	0.15	0.15	60	14
3	2	77	0.10		68	14
4	2	68	0.05	0.05	74	20
5	½	50	0.10		72	16
6	2	50	0.05	0.05	68	12

Table II—Result of Germination Test Made on Barley Steeped According to Table I.

Test No.	Observation of Germination after days	Growth	Average Non-growing Kernels per cent	Short Growth per cent
1.....	5	Not normal....	15.0	20.0
2.....	5	Not normal....	20.0	18.0
3...	5	Slow.....	7.5	3.9
4.....	5	Slower than 3..	8.5	3.6
5.....	5	Nearly normal.	1.4	1.9
6.....	5	Slow.....	4.2	4.6

Table III—Pilot Plant Malting Test Made on Alkali-Steeped Barley Under Actual Working Conditions.

Test No.	Time of alkali steeping in hours	Temperature Deg. F.	Addition of KOH per cent	Addition of Na OH per cent	Growth	Days of Flooring
1	..	50	....	....	Normal	8½
2	2	50	0.05	0.05	Slow	10
3	2	50	0.075	0.075	Slow	10
4	½	50	0.05	....	Normal	9

Table IV—Analysis of Malt Made Under Pilot Plant Conditions Given in Table III.

Water per cent	Extract per cent	Extract Dry, per cent	Color	Appearance	Wort
3.2	79.01	81.70	0.18–0.20	Very	Brilliant
3.2	78.66	81.25	0.32 }	good	Clear
3.2	78.27	80.85	[1]		Opalescent
3.6	78.66	81.59	0.18–0.20	Good	Brilliant

[1] Poor, malt is gray, husk chipped.

Table V—Malting of Alkali-Steeped Barley Under Factory Conditions.

Test No.	Time of alkali steeping in hours	Temperature Deg. F.	Addition of KOH per cent	Addition of Na OH per cent	Growth
1	..	48	....	....	Normal
2	2	48	0.10	....	Slow
3	..	48	....	....	Normal
4	2	90	0.10	....	Slow
5	2	95	0.05	0.05	Slow
6	1	77	0.05	0.05	Slow
7	½	49	0.03	....	Normal

Table VI—Analysis of Malt Made Under Factory Conditions Given in Table V.

Water	Extract per cent	Extract Dry, per cent	Color	Wort
4.2	78.99	82.43	0.20–0.22	Brilliant
4.2	78.49	81.93	0.18–0.20	Clear
3.5	80.26	83.11	0.18–0.20	Brilliant
3.5	70.99	80.82	0.19–0.21	Opalescent
4.4	77.00	80.52	0.15–0.17	Clear
3.9	78.00	81.09	0.15–0.17	Clear
2.9	79.90	82.30	0.18–0.20	Brilliant

WHEN BARLEY IS STEEPED with a hot alkaline solution, a brown liquid results which to the ordinary observer might be regarded as a removal of impurities. However, practical experience has shown that the substances, which are extracted and lost through this hot alkaline steeping, are essential to the final product, beer. They supply a large part of the "body" and "fullness" to beer. This quality is a very desirable and essential factor, especially in this country where the public demands a beer which is satisfying. All beers produced by the hot alkaline steeping process are usually watery, thin and have little appeal to the palate.

As previously stated, the originator of the hot steeping process has claimed that certain substances, called testines according to Moufang, are removed by the action of heat and alkali. However, it has been found that this is not the case. After hot steeping, the testine content was not reduced at all. In some cases, it was increased,—a fact which disproves the reliability of that theory.

A 4 to 5 per cent beer which has been properly brewed and aged does not require the hot steeping pretreatment of its barley. Germany, where the hot steeping of barley began, has returned to proper scientific brewing methods and uses only high grade grain to give the beer-consuming public the best beer possible. With good high quality barley available there is no reason or excuse whatsoever for using hot alkaline steeping at the present time.

REFERENCES

1 Mündler, Zeitschrift des gesammten Brauwesens, 1933 pp. 16-22.

2 Mündler, Zeitschrift des gesammten Brauwesens, 1933 p. 24.

3 Knorr, Der Kolloidale Zustand der Stoffe.

Fresh Fruits Marketed by TRACTOR-TRAILER UNITS

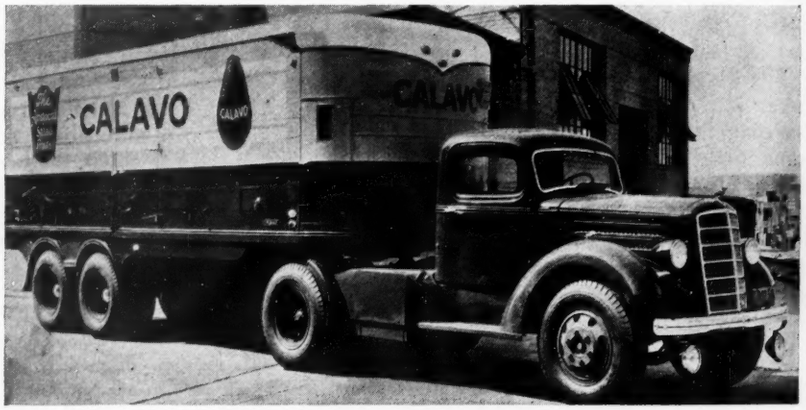
Motorized Distribution Provides A Quick and Economical Service

EAST, WEST, NORTH OR SOUTH—wherever good roads lead—motor equipment is providing a quick and economical distribution of fresh fruits to primary markets. Strawberries from Florida to Texas; Calavos from California to Oregon; celery from Michigan to Illinois; oranges and grapefruits from inland Florida to seaport; and California fruits over the mountains to Utah are just a few of runs being made.

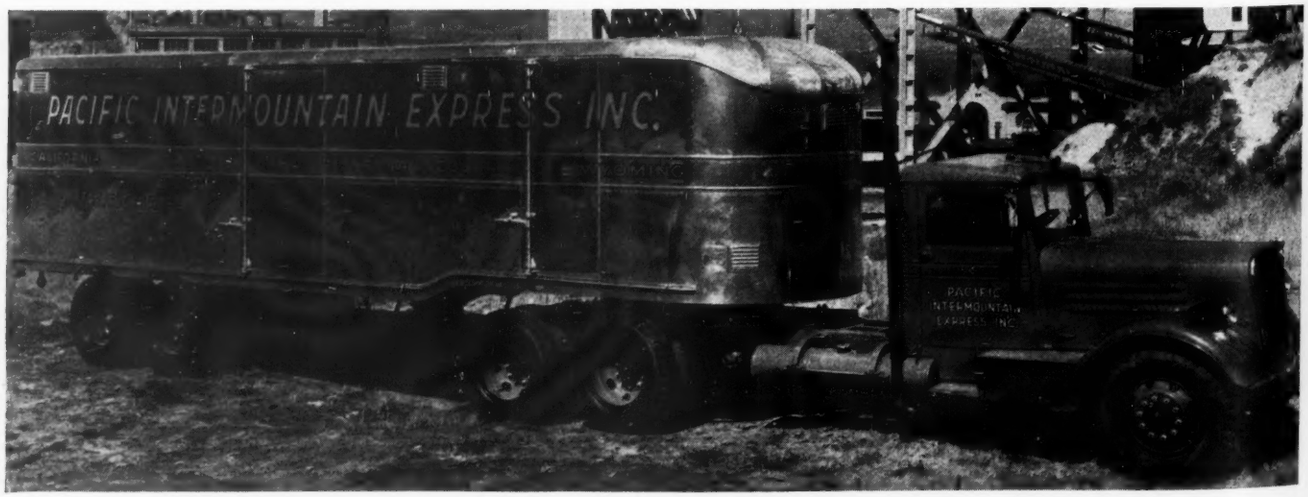
Five years ago such runs were unheard of. Today they are fast becoming commonplace. Trailers are invariably used in the work as they permit larger loads to be moved. In the California to Utah service mentioned, the trailer bodies are made of aluminum and increase the payload by 3,400 lb.

The trailer bodies are insulated and refrigerated by one of several methods, thus assuring the proper condition of the fruit at its destination. Where rail service does not exist between the points of origin and destination; where it takes a roundabout course or it is slow or inadequate on a direct route, the motorized service provides both a quicker and cheaper means of distribution.

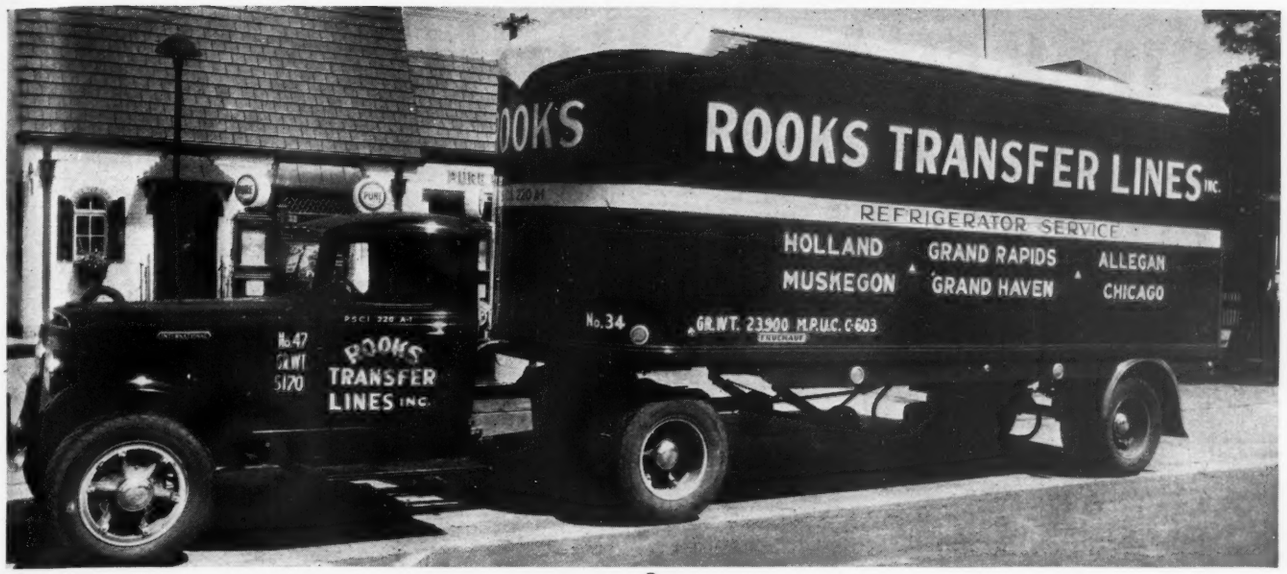
The Calavo, grown in California, was formerly a great luxury in distant cities. Under its Eastern name, alligator pear, it often retailed at a dollar apiece, because of the cost of transportation and of the fact that the edible portion of the fruit spoils easily. With the advent of rapid, motorized transportation and modern



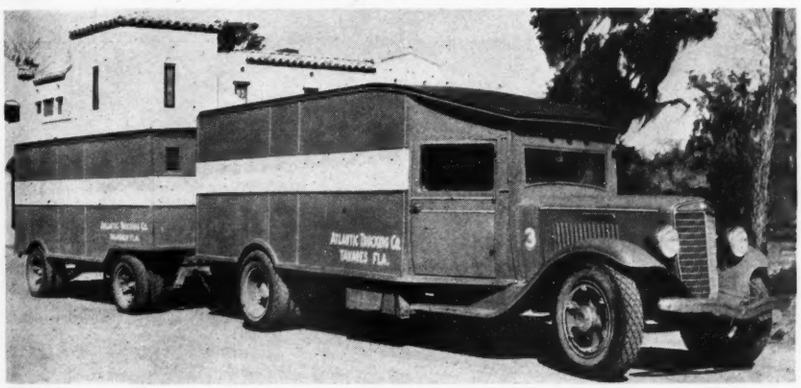
This tandem-axled Freuhauf semi-trailer and Mack tractor carries 24,000 lb. of Calavos on each 40-hour, 1,050-mile run between Los Angeles, Calif., and Portland, Ore. The trailer body is refrigerated to keep the fruit at a temperature of 40 deg. F.



One of seven semi-trailer units carrying perishables over the mountains between San Francisco, Calif., and Salt Lake City, Utah. They cover about 500 miles per day. To give increased load capacity the trailer bodies are made of aluminum. They are 33 ft. long and weigh 3,400 lb. less than the 28 ft. composite wood bodies they replaced. The weight of the Kenworth tractor is reduced 1,000 lb. by the use of 960 lb. of aluminum alloys for cab, hood, running boards, fuel tanks, hubs and all frame castings.



The above 22-ft. Freuhauf semi-trailer carries 15,000 lb. of celery, meat and general produce on a 200-mile haul between Holland, Mich., and the Chicago market. The body is insulated with Dry-Zero and is refrigerated by ice and salt in order to maintain a temperature of 40 deg. F. at all times. The tractor is an International Harvester Co. model.



A truck and four-wheeled trailer used to haul oranges, grapefruit and other Florida fruits between Howey and the port of Jacksonville, Fla., a distance of 178 miles. The trip is made in six hours.

Labelled as handling both fresh fruits and beer and carrying a safety message on its' rear, the above trailer hauled strawberries from Florida and Louisiana to the Texas market. The trailer, a Trailmobile, is insulated with Dry-Zero and is refrigerated by the Whitaker-Upp mechanical system described in Sept., 1936, *Food Industries*.

refrigeration methods, it is now sold as far east as Detroit and New York for as little as 10 cents. It sells for even less in cities closer to Los Angeles, Calif., the center of the producing area.

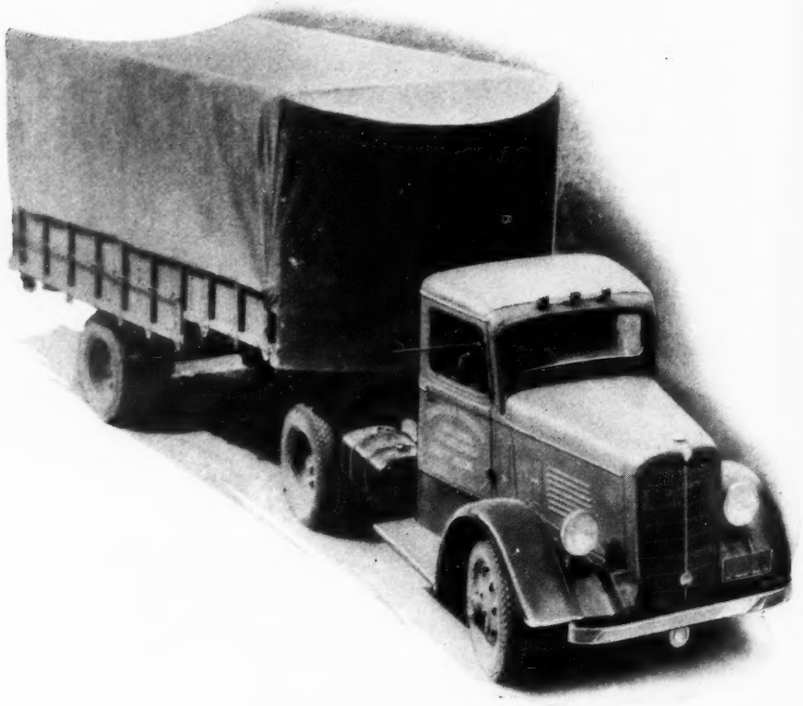
The Mack tractor and Freuhauf trailer shown in an accompanying view hauls 24,000 lb. of Calavos between Los Angeles and Portland, Ore., a distance of 1,050 miles. The run is made in 40 hours. The trailer is refrigerated by means of dry ice and fans providing a circulation of air. This keeps the fruit at a temperature of 40 deg. The estimated 1937 crop of Calavos is 13 million tons. A large part of this tonnage will move cross-country in motor equipment similar to that which is shown here.

The Pacific Intermountain Express, one of the tractor-trailer combinations shown, hauls perishables between San Francisco and Salt Lake City, Utah. It covers 500 miles per day. The unit is featured by the use of aluminum alloys in both trailer body and truck chassis. The tractor is powered by a Cummins Diesel engine.

The Rooks Transfer Lines trailer shown is one of twelve used on a 200 mile run between Muskegon, Mich., and Chicago. They carry celery, meats and general produce.

The Ben E. Keith Co. trailer, left, hauls strawberries from Florida and Louisiana to the Texas market. The Atlantic Trucking Co. train hauls fruit from inland Florida points to the port of Jacksonville.

Trucks Are Built to Run



How to keep them at it and avoid the cost of unnecessary timeout.

THERE ARE VARIOUS PRECAUTIONS which fleet operators may take to get the most out of their equipment. Efficient management not only will avoid excessive idleness on the part of motor vehicles, but will keep them out of the repair shop as much as possible. Also, there are means of reducing waste in time and mileage on the daily run. All of this is brought out in the letters on this page, from executives who operate trucks in the food industries.

Checks Waste in Time, Mileage

The initial step in reducing time-out in truck service is a system of signals, by means of a monthly chart, to see that the trucks are regularly serviced and maintained.

In a small garage, a large blackboard listing the number of the trucks down the board and the days of the month across serves best. In a large plant, the time clerk, or car-cost clerk, would naturally keep this follow-up record.

Lack of work is not a problem for a bakery truck. It invariably covers a regular territory and follows a prescribed routing.

The greatest problem on bakery routes, assuming that the salesman is a good truck operator, is that of cutting down lost time and useless mileage. To account for and then eliminate lost time, there should be some type of spring-wound recording device to register over the period of a day or week when the truck is not operating, when the engine is only idling and, finally, when the truck is actually moving. Such registers need not be used continuously on all the trucks, but a certain number of them could be shifted around, at the rate of about one to every six trucks. Waste mileage is best eliminated through a study of road maps in conjunction with the above chart records. Personal coverage of the territory by the route supervisors can also do much to save both mileage and time.—JOHN THIES, *Manager Accounting Service Department, Quality Bakers of America, New York.*

Services Trucks at Night

To reduce time out to a minimum, we have all of our lubrication and tire changes taken care of after working hours. All repairs are planned for Monday, whenever possible, because we have no regular delivery routes for Monday as our sales force does not operate on Saturdays.

We have a "daily truck record" for each truck. This shows when the truck works and also when it is idle, giving the reason for its being idle.

It is positively necessary to differentiate between time-out for mechanical repairs, body repairs and painting, road failures and lack of work. Time lost due to mechanical repairs and so forth is a determining factor in replacing and buying new equipment.—GEORGE GREANEY, *Diamond Ginger Ale, Inc., Waterbury, Conn.*

Uses Forecast Forms

Our business is seasonable, and we perhaps have a great advantage over other industries in that we have the entire cold season in which to prepare our fleets for summer. We also are rather fortunate in that we have little or no cause for time-out in truck service during the summer.

Usually, forecast forms are prepared for the normal operation of the trucks. This is not guesswork, but is handled by experienced men who are familiar with mechanics, overhauling and maintenance, as well as painting. These forecast forms not only give us the estimate of cost, but also permit us to prepare other forms which are furnished by the different shops showing just how many trucks can be taken in, at what different intervals they are to enter the shop and the period required for the work to be done in the shop.—W. J. DESMOND, *Manager, General Ice Cream Corp., Hartford, Conn.*

DIRECTED EXPERIENCE

What is the most important invention?

Some time when conversation drags you can easily start a big argument by inquiring what is the most important invention that has been discovered up to now. Try it, and see what an amazing variety of opinions such a question will bring forth.

No better answer to the question has come to our attention than the opinion that the most important invention of all is the discovery of the process of inventing. Which is just another name for research. One of the great inventors of the day, Charles Kettering, president of General Motors Research Corporation, says that there is no fundamental difference between looking for something you really want to find and something that nobody wants or knows what to do with.

Speeding Up Experience

Accelerated experience is the term that is often applied to research and invention. Instead of waiting for the accidental discovery of things that we want, we now know how to speed things up. We get an idea of what we want to know and go after it, and usually the answer is found after a few months or years of steady work. Occasionally there are problems that baffle all comers.

Broadly speaking, the process of research or invention is that of controlled experience. Instead of waiting for accidental variations, which may possibly lead to the discovery of useful knowledge, the research worker tries this and that under controlled conditions and thereby gains experience at a greatly accelerated rate.

Two important points arise from the foregoing:

1. Somebody has to know what the research man is going after or he may be working on a futile problem. It's up to management to decide what should be discovered.

2. By the use of the method of systematic research or inventing the company can get information long in advance of others who are depending on ordinary experience.

Developing Experience in Employees

There is a curious similarity between the purposes of research and employee training. Most folks never think of it in that light, however, nor do they think of the method of training employees as a process of accelerating their experience. Yet is there any difference other than working with things or substances in research work and working with human beings in employee training?

As their final objectives the two activities—invention and employee training—both aim at better ways of doing things or new ways of doing something. Neither of them should be undertaken unless management knows what it wants accomplished. Usually a company's management knows more about what is worth while to accomplish by employee training than what is worth while to discover by research and invention. On the other hand it is usually easier to hire a good research man than it is to find the right man to carry out employee training.

Different Types of Men Needed

Although these two activities—research and employee training—are very important they require very different types of men to carry them out. For, though the knowledge which results from accelerated experience in the research or engineering department can be written on paper and made a part of the company's permanent assets, the results of the accelerated experience, known as employee training, must be written in the human heart and the memory of the employee. Obviously it becomes his property, not the company's. Nevertheless a staff of fully trained employees is also an asset probably equivalent to the value of a good research department.

However, neither form of accelerated experience is worth while unless management knows its stuff. No amount of training or no amount of research is a substitute for good management.

New Form of Employee Training Needed

False prophets are in their hey-day this year. There never was a time when labor organizers could work under conditions so favorable as now exist. Of the organizers about which we know anything there seem to be only two types. The first of these are "legitimate"—"legitimate" because of legislative or quasi-administration sponsorship of their activities. The others are merely racketeers. These are the ones that are finding the easy pickings today. These are the false prophets, and usually they are unpleasant, tough customers.

For the thug type of racketeer labor organizer, the effort is merely to set up a way to easy money. The motives back of his intimidating activities are purely selfish gain for the individual and one or two lieutenants. He is in the racket for what he can get out of it and he is not there for any motive of helping to serve his fellow man. He pulls a strike to show his power. He is not affiliated with the American Federation of Labor, nor with the newly formed C.I.O. unions that are growing so rapidly under the leadership of John L. Lewis.

Employees, as well as management, in plants which are not already unionized have great need for ability in recognizing an organizer for what he really is. It is management's obligation to protect its workers from exploitation either by management or by sinister, irresponsible outsiders. A new form of employee training is indicated.

One of the first things the racketeer wants is money from members in a newly formed labor organization. If employees are adequately advised they will know that fact, and the further fact that they can and should choose their own treasurer from their own folks in the event an organizer shows up.

A fairly certain protection of the employees against racketeering labor organizers is a firm determination that no money will be given to outsiders.

Lest You Forgot

It is difficult effectively to control current plant operations from the laboratory. Yet this often is necessary if high quality is to be attained. How to accomplish this is described in the article, "Better Inspection Control by Signal Lights," FOOD INDUSTRIES, May, 1934, page 212.

Everyday
OPERATING PROBLEMS

ELECTRIC BOILERS

Help Balance Steam and Power Loads

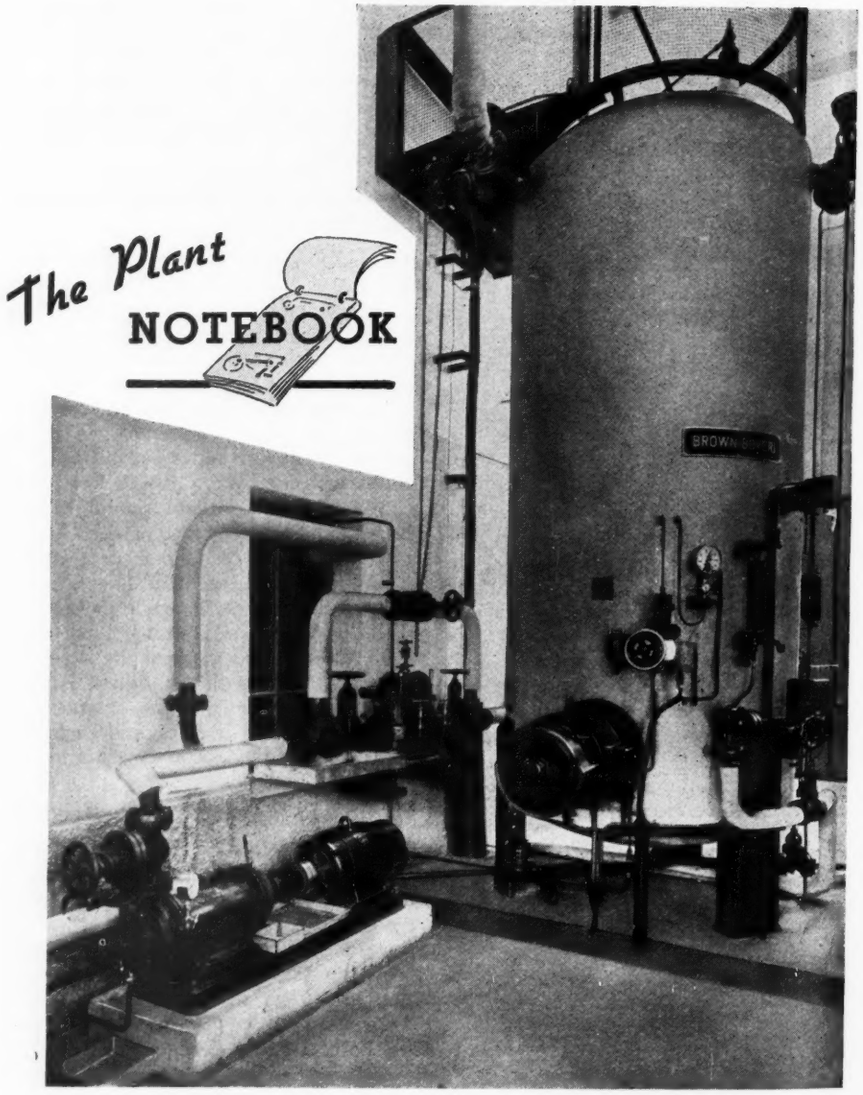


Fig. 3—Water jet type electric steam boiler installed in a sugar refinery at Aarberg, Switzerland.

SOME FOOD MANUFACTURERS IN EUROPE, who generate their own power, find that a better balance of steam and electric loads is obtained through the use of an electric steam boiler as an auxiliary. Where bled or exhaust steam from a turbine is used for process heating, the steam and electric loads are often far out of balance, causing wasteful operation. In such cases, if the steam requirement is relatively greater than the power demand, one expedient is to install an electric steam boiler alongside the steam-using equipment. This also has the advantage of avoiding the first cost and wasteful operation of long steam pipelines.

Electric boilers used in such plants are of two kinds, constructed either for raising steam and heating water for immediate use, or for storing steam and hot water until required. It is therefore necessary to differentiate between electric hot water boilers, electric hot water accumulators, electric steam boilers, and electric steam accumulators. In the course of time two systems of electric heating have been developed, the field of application of each being limited by the kind of current used and the load required.

Small electric steam and hot-water boilers absorbing only a small load of either direct or alternating current, and boilers for which only direct current is available, are made on the indirect resistance principle. They are fitted with coil or strip resistances of high-grade, heat resisting material, mounted on insulators and inserted in heating tubes. To regulate the load on such boilers to suit the momentary demand for steam or hot water, the heating tubes are coupled in groups and connected to the mains through suitable switches and fuses. If electric resistances, such as are used for smaller steam and hot-water boilers, were adopted for larger plants, it would lead to many difficulties because of the many connections and contacts which would then be required. They are therefore unsuitable for such work.

For heavy loads, in special cases even for loads of over 10 kw., and particularly for voltages exceeding 500, the only plants suitable are those built according to the electrode system, in which the water itself is utilized as resistance. This system can, however, only be adopted when alternating current is available, since direct current would decompose the water into hydrogen and oxygen, forming an explosive mixture.

The two principal types of electric boiler installed in the food processing industries are the electrode and the water-jet boilers.

The electrode boiler, which is shown in Fig. 1, consists of an electrode *A*, completely immersed in the water, and surrounded by a movable insulating tube *B*, the so-called evaporating tube. At any position of the regulating device, the evaporating tube is completely immersed in the water. The position shown in Fig. 1 corresponds to the minimum load of the electrode system. Current flows through the water in the lower and upper parts of the electrode

A in the evaporating tube to the grounded parts of the boiler. The water in the evaporating tube is thereby heated, and consequently rises, the colder water flowing in below to take its place. By raising the evaporating tube, the path of the current from the lower edge of the electrode to the lower edge of the evaporating tube is shortened, the resistance is decreased, and consequently the load is increased. The load reaches the maximum when the electrode is still about 2 in. inside the evaporating tube.

With this arrangement, only relatively small loads, up to about 150 kw. per electrode, can be carried, at voltages up to about 8,000. At higher voltages, the steam bubbles formed round the electrodes are not effectively removed from the electrodes by the upward flow of the water. As they adhere to the electrodes, they act as insulators, and cause a temporary decrease in the effective electrode surface, and consequently also fluctuations in the load. This drawback, in the case of heavy loads, is overcome by removing the bubbles by forced circulation, by means of a pump which keeps the water in the boiler circulating through the electrodes.

The principal feature of the water-jet boiler is that the electric current does not flow from immersed electrodes through a stationary column of water, but is conducted through water jets which, as will be described later, radiate continuously from nozzles to the electrodes. The construction and mode of operation of the water-jet boiler is shown in Fig. 2.

This boiler comprises essentially the boiler proper *a*, with the built-in electrodes *b*, the ejection pipe *c*, a circulating pump with driving motor *d*, the usual boiler fittings and the requisite switch-gear. The three electrodes are arranged concentrically about the vertical ejection pipe, which is provided with three vertical double rows of nozzles. The circulating pump delivers water from the lower part of the boiler into this tube, from which it flows in jets against the electrodes. These are so constructed that the water impinges on their inner surface tangentially, spreads over the inner surface and is so deflected that it acquires a circulative and downwards motion. In this way, dispersion of the water, which would interfere with the electrical conductivity, is prevented. At the same time the centrifugal effect assists the separation of the steam produced from the water.

At their lower ends the spiral shape of the electrodes changes into a circular one, so that a tubular extension is formed which collects the water caught in the spirals and concentrates it into a jet. A sheet-metal cross is built into this tubular extension to stop the circulative motion so that the water leaves the electrode at the bottom in a compact downward jet. The water then impinges on a perforated plate, which is electrically connected with the side of the boiler, and flows through it into the collecting chamber.

In this manner two current paths of constant length are formed per phase between the neutral point of the electrical system, to which the boiler shell and the injection tube are connected, and the electrodes, one of the paths being between the ejection tube and the electrodes, and the other between the electrodes and the afore-mentioned perforated plate. Along both these paths the water is heated and evaporated due to its own resistance. Under normal operating conditions the jet water is practically at evaporation temperature, as it flows continually in a closed circuit, so that a very small portion of the electrical energy supplied is used for heating the water, the major portion being used for evaporating it.

The output of the boiler is regulated exclusively by varying the quantity of circulating water, so that, according to the output, a greater or smaller number of nozzles are in use. Under maximum load, therefore, water sprays on to the electrodes over their whole length and under partial load over part of their length only. The adjustment of the quantity of water is effected by the throttle valve *e*.

This boiler is normally built for operation with three-phase current of 2,000 volt, upwards, and for outputs of 10 to 300 kw. and above. The boiler can, however, be designed for single-phase and two-phase alternating current. It can be built to suit all steam conditions met with in practice.

Fig. 3 shows a water-jet boiler which was put to work in 1935 in the Zuckerfabrik und Raffinerie Aarberg A.G., Aarberg (Switzerland). This boiler is built for a rated power imput of 6,000 kw. and for a three-phase supply at 16,000 volts. It was built to produce a pressure of 256 lb. per sq.in. gage. When working with feed water at 176 deg. F. the full load corresponds to a production of 19,000 lb. of steam per hour. It has been in continuous 24-hour service ever since it was taken over, including Sundays and holidays. Occasionally the output has been increased to 22,000 lb. per hour of steam.

Formerly, steam generation in this sugar mill was by four inclined-tube boilers with coal firing and each of these is built for an output of 7-8 tons of steam per hour. It became necessary to enlarge the boiler plant before the beet harvest of 1935. It would have been impossible to install boilers of the ordinary type in the time available and this caused the owners to purchase an electric boiler. The unit was delivered and put to work within four months and was in perfect working order when the harvest began.

In a typical installation of the electrode type boiler, each boiler can take a load of 7,000 kw. on a 6,000 volt, three-phase, 42-cycle supply and raise 9 tons of steam per hour at a pressure of 220 lb. per sq.in. The electrode boilers work in conjunction with two heat exchangers. This has the advantage of making the plant independent of the quality of the feed water used for evaporating purposes. The electric boilers themselves contain only distilled water, and a chemical is added to the water to give it the correct conductivity. The distilled water is evaporated in the electrode boilers, and the steam passes through the heat exchang-

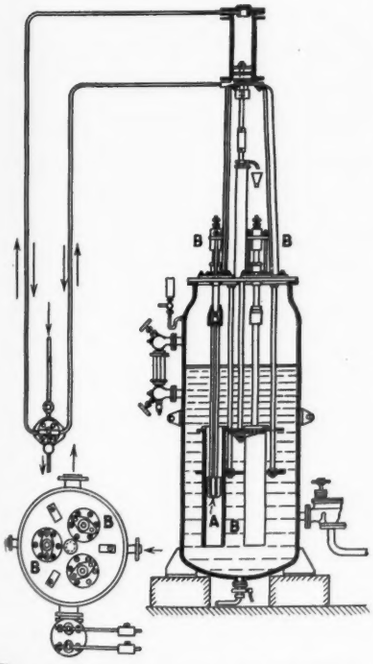


Fig. 1.—Electrode type of electric steam boiler.

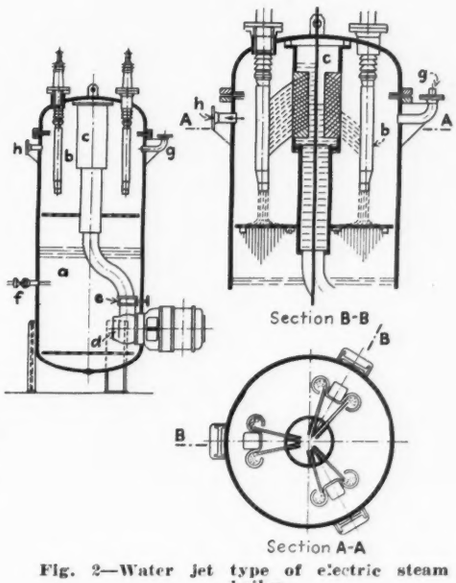


Fig. 2—Water jet type of electric steam boiler.

ers, afterwards returning to the electrode boilers as condensate. This method of working results in a long life for the insulating members in the boilers and great reliability for the plant.

The importance of the electrode boiler for such a plant depends on the fact that it allows the surplus energy from hydroelectric power stations to be utilized in a rational manner. The electrode boiler ensures not only a considerable saving in coal to the owner, but also an increase in the economy of the plant to the producers of hydroelectric energy.

Another interesting plant is that installed in an Austrian brewery. The plant consists of an electric boiler, 32-in. in diameter and 8¼ ft. high, for a load of 700 kw. taken from three-phase, 3,200 volt supply and working at a pressure of 130 lb. per sq.in. An existing Lancashire type boiler serves as storage boiler; it is 7¼ ft. in diameter and 28 ft. long and was built for a pressure of 100 lb. per sq.in. Steam is raised mostly during the night, energy being then available at a cheap rate between the hours of 7 p.m. and 7 a.m. The electric boiler is connected to the storage boiler by delivery and return piping. The plant is filled with water to the normal level in the storage boiler; the circulating pump is then started and the electric boiler switched on to the mains. The whole of the water is heated up, and when steam is required, it can be drawn off from the storage boiler through the existing main steam valve. The load on the electric boiler is regulated by hand, not automatically.

For the electric boiler alone, an efficiency of about 95 per cent was guaranteed; for the electric boiler working in conjunction with the existing Lancashire boiler as storage boiler, the guaranteed efficiency was 66 per cent for one boiling per day and 70 per cent for two boilings. During a 24 hour guarantee trial the efficiency was found to be 80.4 per cent for one boiling and 88.5 per cent for two.

Several plants use off-peak current from the public electric supply, an example of this practice being a Swiss cheese factory.

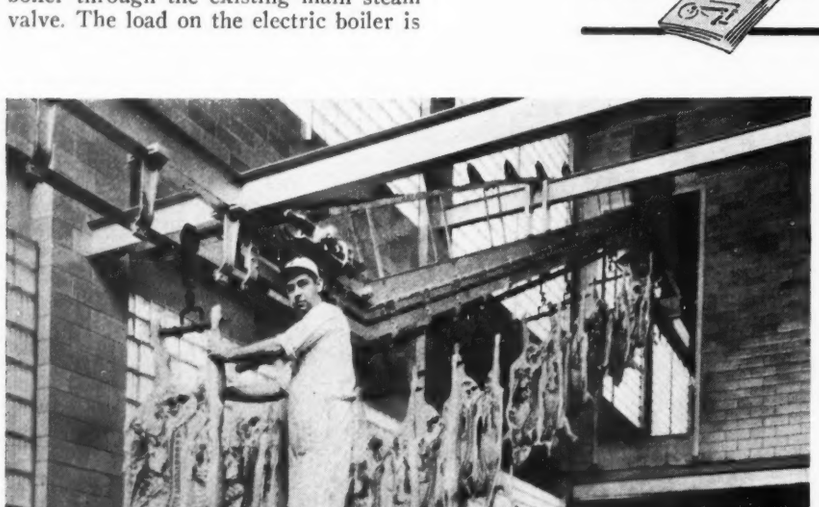
Cheese making falls exactly in the time of year when the power stations are prepared to supply energy during the night at very low rates. The plant referred to consists of two systems of accumulators, each with an electrode system for taking a load of 10 to 60kw. on a 500 volt, three-phase supply. The maximum pressure in the steam accumulators is 103 lb., and about 660 lb. of steam can be withdrawn from each accumulator before the pressure falls below 21 lb.

The two accumulators, each of which is 4 ft. 3 in. in diameter by 11 ft. 2 in. long, are installed in the cellar under the cheese factory. The electric instruments are located in the cheese-making room. The attendance required consists in filling up the accumulators in the evening to the normal level and then switching in the boiler and adjusting the load on it to the amount desired. Current is switched off in the morning by a time switch when the time for the cheap rate of current ends; there is also a temperature switch for switching off when the permissible pressure has been reached.

In the cheese factory at Neuenkirch (Switzerland) a new type of steam boiler has been put into service which is interesting in that it may be fired with either oil or coal, or used as an electric boiler. The boiler consists of two parts; the fuel fired boiler and the electric boiler connected to it. When the fuel fired boiler is in service, the electric boiler may be shut off so that the water contained in it is not heated up. On the other hand, when the electric boiler is in service, the water contained in both boilers is heated by natural circulation.

The combined boiler has an advantage of giving very clean service and requiring a minimum of attendance when heated with electric current. If the electric supply is insufficient or is interrupted, the coal or oil firing can be started up at once. In addition, the boiler system can be combined with electric steam accumulators, so that cheap current, available particularly during the night, can be utilized. The load taken by the electric boiler is 150 kw. corresponding to about 450 lb. of steam per hour, and this load may be regulated as desired between 30 and 150 kw. The coal-fired boiler is one of the vertical type with transverse tubes; it has a heating surface of 55 sq. ft. and works at a pressure of 70 lb. per sq.in.—C. H. S. TUPHOLME, *Farnham, England.*

The Plant NOTEBOOK



Interior view in the new plant of Cudahy Packing Company at Albany, Ga. Ample illumination is available with wall panels that are constructed of glass block masonry, which is translucent but not transparent. All the working areas of this plant were built without conventional windows, but with all wall panels of this glass block. Photograph courtesy of Owens-Illinois Glass Co., Muncie, Ind.

Glycerine For Boiler Scale

To prevent or retard the formation of scale in boilers, the Glycerine Producers Association recommends the use of glycerine. It is said to be useful because of its properties as a solvent.

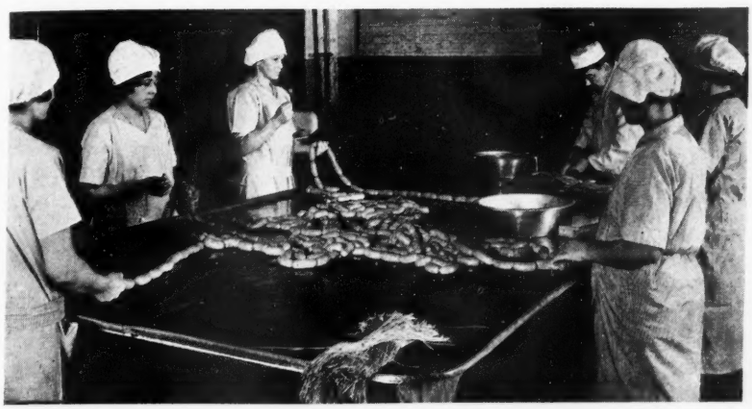
Boiler scale is primarily caused by the formation of insoluble salts in the boiler water. Glycerine in the water is claimed to cause the formation of soluble compounds in place of these insoluble salts.

The lime concentrations, in the course of time, will become too large to be assimilated in this way by the formation of soluble compounds. But, as this happens, a viscous gelatine-like substance is precipitated which does not adhere to the boiler walls. Moreover, it is not carried through the piping by the action of the steam.

No complicated apparatus is involved in this use of glycerine to prevent scale.

CLEANLINESS...

How do you Keep it?



Non-porous surfaces aid cleaning operations particularly when the materials handled on them are greasy or are wet with liquids containing fermentable dissolved solids.

IN EVERY FOOD MANUFACTURING AND HANDLING PLANT surfaces of fabric packing belts, wood tables, and wooden or concrete floors are likely to become badly soiled. In a dirty condition they are sources of bacterial and mold contamination of the products made or handled; especially in the summertime.

Is replacing them with rubber, metal, or tile surfaces the only solution to the problem?

If you depend upon thorough washing and scrubbing what type of sterilizing materials do you find most effective?

Scrubs with Soap, Rinses with Clear Water

Rubber, metal or tile surfaces are more satisfactory but not necessary if the proper maintenance is practiced and dirt is not permitted to accumulate.

In our candy plant we have probably gone to the extreme in doing our utmost to keep floors, belt conveyors, and packing tables clean.

Our plant is not of modern construction but it is at least clean. When the opportunity to build a modern structure comes, we will be very conscious of plant beauty from the cleanliness as well as the production point of view.

Belting used for carrying uncoated candies, which runs for years in some plants without being washed, are scrubbed every day in good soapy water. After scrubbing it is given a good rinse in clear water. This treatment unfortunately shortens the life of the canvas by at least 75 per cent. However we know the belts are clean.

Table tops are of stainless steel, galvanized iron, maple wood or linoleum. They are scrubbed down every night. Stainless steel tops are by far the easiest to keep in good condition.

Paper belts for enrober work are polished off after each run and are replaced every two days. Hand-dipping plaques are also polished clean after each use.

After each day's run our maple flooring is mopped with boiling hot water and a good grade of cleanser.—G. HOOPER, *Miss Saylor's Chocolates, Inc., Alameda, Calif.*

Do You Have a Question?

Questions answered on this page are based on actual inquiries made by readers who want to learn how others handle a troublesome plant problem.

Your participation in this exchange of experiences and ideas is cordially welcomed. What you do may be "old stuff" to you but new to the other fellow. Let us pass along your solution.

Also you may be wrestling with a problem which is "old stuff" to some one else. Why not give them a chance to help you?

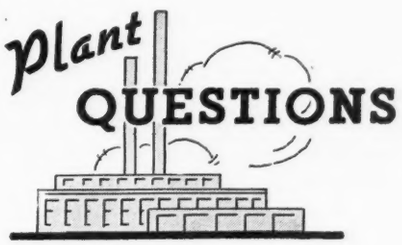
Employs Clean Workers. Uses a Disinfectant

Sanitation and cleanliness are not exactly the same although they are closely related. Both are more dependent upon the attitude of the management and of the workers than upon the materials used in belts, tables or floors.

In the first place we employ only workers who show a willingness and desire to keep themselves clean and sanitary. We then see to it that they have the tools or utensils necessary to do their work and that the equipment with which they work is in good repair. Then there is no excuse for careless or sloppy work which results in lack of cleanliness. Accidents do happen in the best of plants as well as families. If a mess results it is cleaned up at once; by the worker who had the accident if a definite individual or group is to blame.

Plenty of scrubbing with a neutral soap, good brushes or mops, and hot water followed by two clear water rinsings is our formula for keeping belts, tables, and floors clean. On week-end clean-ups a good wash down with a dilute solution of a chlorine disinfectant keeps us sanitary as well as clean. One of our troubles is the possible fermentation of any sugar or syrup residues that might be left after evaporation of rinse water.

We do use rubber-coated packing belts. Table tops are of close-joined poplar wood. Floors are of both hard maple wood and hard surfaced concrete.



Next Question

Use of uniforms for workers is becoming standard practice throughout food manufacturing. But questions are still being asked about how details of the practice should be handled. Some of the questions are:

1. Should the company or the worker pay for the uniform?
2. Should the company or the worker be responsible for the laundering?
3. Who should decide upon design of uniform and when or how often the uniform should be changed?
4. Should uniform regulations apply to men as well as women workers?

How do you take care of these details?

New DISCOVERIES AND INVENTIONS

BAKERY PRODUCTS

Vitamin C to Increase Baking Strength of Dough

TO IMPROVE THE BAKING STRENGTH of a dough without imparting to the baked goods any extraneous flavor of any kind, a small amount of ascorbic acid (Vitamin C) is added. Either the free acid or one of its salts, such as the sodium salt, may be employed. Indeed, the ascorbic acid need not be isolated as such at all but may be added in the form of a citrus fruit (orange, lemon or grapefruit) juice since these fruits are relatively rich in ascorbic acid. A distinct improvement in baking strength is obtained at an ascorbic acid concentration so small that it cannot be detected by taste. As a specific example, according to the disclosure in British Patent 455,221 (granted Jan. 7, 1937, to Aktieselskabet Dansk Gaerings-Industri), a dough is made of 250 parts by weight of flour and 134 parts by weight of water containing salt, yeast, malt extract and such other ingredients as may be desired. To this dough is added 1 part by weight of water containing 0.0006 part by weight of ascorbic acid and thorough admixture is effected in a kneading machine.

Fish Flour in Bread

IN REGIONS where edible fish are cheap and abundant but meat is scarce and expensive, an odorless, palatable fish flour would be an important contribution to the diet of the people. The principal obstacle is the strong fishy odor (and taste) of ordinary fish flour. A search for an effective deodorizing solvent which could be employed at a moderate cost revealed the fact that ethyl alcohol (94 per cent strength) is superior to gasoline, acetone, ether and carbon tetrachloride for this purpose. In the experiments on a laboratory scale, three or four extractions were required. The product was quite odorless and entirely palatable.

To ascertain whether or not there had been any appreciable loss of food value in the extraction process, feeding tests were made with a large number of albino rats. Bread containing only 3 per cent of the treated fish flour supported vigorous growth and health, with a normal reproduction cycle, in the test animals while the same bread without this addition was a totally inadequate diet. These results indicate that the deodorized fish flour is an excellent nutritional addition in bread, crackers and the like.

Digest from "Studies on the New Utilization of Marine Fishes," by Sotaro Tokuyama. *Scientific Papers of the Institute of Physical and Chemical Research* 29, 129, 1936.

CANNED FOODS

Tin in Canned Foods

IN SO FAR as the amount of tin taken up by canned vegetables depends on the kind of vegetable, rhubarb takes up more tin than do pumpkin and tomatoes, while spinach takes up the least among these four vegetables. If the canned material has a relatively high nitrate content, there is greater absorption of tin. Amino acids and acid amides have little effect on tin content, and this is true through the first months of storage as well as during sterilization of the cans. The quality of the tin plate has an important bearing on the amount of tin absorbed, and the porosity of the tin plate is the one feature which demands attention in this respect. The temperature and time of heating the cans also have their effect and should not be needlessly severe.

Digest from "Causes of Tin Absorption in Canned Vegetables as Related to the Kind of Vegetable," by K. S. Grzhivo and K. I. Novikova, *Konservnaya Promyshlennost*, 1936, No. 5, p. 10.

New Way to Test Jelling Power of Pectin

A NEW, RAPID, COLD METHOD for measuring the jelling power of pectin extracts has been used for testing various pectin preparations. One, an extract containing 3.5 to 3.8 per cent calcium pectate, had such extremely high activity that noticeable jelling of the standard test solution began in less than a minute and in about five minutes the jelly was hard enough to cut with a knife. A thick pectin preparation with 1.7 to 1.9 per cent calcium pectate required several minutes for noticeable jelling and about ten minutes to set the jelly. Its final consistency was fairly stiff but not hard enough to cut. A thin pectin preparation (0.8 to 0.9 per cent calcium pectate) thickened the test solution but was not able to convert it to a jelly. Since pectin preparations gradually lose jelling power with age, even though their calcium pectate content remains the same, a reliable and convenient method for testing is much needed.

The test solution used in the new method is a fruit preparation, of creamy consistency, containing no alcohol and no added sugar. (Its composition is not stated.) The test requires no boiling, is inexpensive and requires only a very little time.

Digest from "New Rapid Method For Measuring the Jelling Power of Pectin," *Chemiker-Zeitung* 61, 49, 1937. (Published in Germany.)

Quick Calculations for Tomato Products Manufacturers

A NOMOGRAPH is a graphic method of calculation by drawing lines between points on a special chart. Such a chart has been prepared to permit rapid figuring of the volume of a more concentrated tomato pulp from a less concentrated one, or *vice versa.* It is arranged so that the refractive index can be used instead of the specific gravity, or the percentage of total solids, and thus becomes a handy tool on the cook deck.

Digest from "A Nomograph for Calculation of Volume of Tomato Pulp," by C. A. Greenleaf, of the National Canners Association. *Food Research*, 1, 525, 1936.

FATS AND OILS

Bleaching Oils With Peroxide

FOLLOWING THE DISCOVERY, some years ago, that fats and oils can be successfully bleached with concentrated hydrogen peroxide where the dilute solutions had failed, good results were obtained

in peroxide bleaching even when the oils were highly colored. In very difficult cases acidification of the oil with 1 per cent of sulphuric acid (specific gravity 1.62) accelerates the reaction sufficiently so that about 0.5 per cent of 45 per cent hydrogen peroxide will give a good bleaching effect. But the processers of vegetable and animal oils and fats have still had to contend with the fact that oil and water will not mix. In other words, the most efficient utilization of the concentrated hydrogen peroxide solutions has been hampered because the oil and the reagent will not dissolve in each other.

An expedient which has been used sometimes to promote intimate admixture of two immiscible liquids is to add a third liquid which is soluble in both. In this case, the auxiliary liquid must be one which will not leave any undesirable residue in the treated oil. Such a reagent was found in acetic anhydride. It must be added to the oil at the same time with the hydrogen peroxide and must *not* be mixed with the hydrogen peroxide before it is introduced into the oil. The quantity of acetic anhydride should be about equal to that of hydrogen peroxide, namely 0.5 to 2 per cent of the oil depending on the bleaching effect to be obtained. The acetic anhydride can be easily washed out of the bleached oil, especially with slightly alkaline wash water. Bleaching by this method is so rapid that it is usually complete within an hour, and good results are obtained even with very dark oils.

Digest from "Bleaching Fats and Fatty Acids With Hydrogen Peroxide," by A. Jordan, *Oele. Fette, Wachse, Seife, Kosmetik*, p. 14. Oct., 1936.

DAIRY PRODUCTS

New Source of Aroma of Butter

DAIRY CHEMISTS have long believed that the characteristic aroma of butter is due to a peculiar chemical compound called diacetyl. It is related to acetic acid, and also to butyric acid(one of the acids which sometimes make butter rancid). So much evidence points to diacetyl as the carrier of butter aroma that few have been bold enough to dispute it. But recent observations have brought out a new contender, not to usurp, but to share the position of diacetyl.

The new carrier of the true butter aroma is called methylglyoxal. Its name would not suggest any relation to diacetyl, yet the two substances are close chemical cousins. They can both be produced by the bacteria of milk. Present laws declaring artificial addition of diacetyl to be adulteration do not apply to methylglyoxal. If confirming experiments support the new observations, artificial aromatizing with methylglyoxal may be legal under some pure food laws. The investigation was made in the dairy laboratory of a farm-cooperative in France.

Digested from "Investigation of Diacetyl" by Jacques Blaisse and Robert Martin. *Lait*, 16, 119, 243. (Published in France.)

Making Bel Paese Type Cheese

DEVELOPMENT OF A PROCESS for making Bel Paese type cheese has been announced by the Bureau of Dairy Industry of the U.S. Department of Agriculture. This cheese is a soft, very white variety of the product. Bel Paese is a copyrighted name of the Italian manufacturer.

Similar cheeses have been produced in Europe and have been marketed as the "Fleur des Alpes" and "Schoenland."

This type of cheese as produced by the Bureau is mild, slightly salty and has a characteristic flavor and a soft waxy texture, so that it can be both sliced and spread.

In the manufacture either good quality raw milk or a pasteurized milk may be used, say the Bureau experts. A small amount of lactic starter is used and enough rennet is added at 104 to 110 deg. F., to obtain the desired "break" in about fifteen minutes.

The curd is cut and stirred rapidly when it has attained the desired firmness. This is done to insure rapid and uniform expulsion of the whey. After the curd particles have dried sufficiently the whey is drawn off and the curd is dipped into suitable forms which are placed on reed mats.

Draining of these forms takes about from five to seven hours, and the best results are reported at a temperature of about 80 deg. The cheeses are turned occasionally during this period.

Following the draining, the cheeses are put in a 18 per cent salt brine solution at 54 to 60 deg. F., and kept there for from fourteen to eighteen hours, after which they are put in a curing room with a temperature of about 45 deg. F. and a relative humidity of 80 to 90.

The average yield is from 11 to 14 lb. to each 100 lb. of milk.

Over-Irradiated Milk

GROSS OVER-IRRADIATION OF MILK has been known to confer "peculiar" or "burnt" odors and flavors that are described variously as "activated," "burnt feather," "burnt protein," "mushroom" and even terrible.

The time of exposure to ultraviolet rays required to produce an "activated flavor" varies from 10.5 to 30 min. for milk, depending on the source of radiation, 15 to 53 min. for cream, 13 to 30 min. for skim milk and 11 or 12 min. for buttermilk. Prolonged irradiation, through glass as well as quartz, will alter the flavor of milk but when the individual milk constituents are irradiated separately the flavor is altered when the energy is transmitted through quartz but not through glass. No explanation is given.

Digest from "Observations on the Source of Flavor in Milk Exposed for Prolonged Periods to Radiation," by Weckel and Jackson, *Food Research*, 1, 419, 1936.

SUGAR

Refining Sugar

AN IMPROVED METHOD for efficient hypochlorite bleaching of sugar solutions in the refinery, without leaving any residual chlorine in the syrup, uses acids and acid salts as auxiliary agents with the calcium hypochlorite. As described in British Patent 453,129 (granted Nov. 26, 1936 to P. Sanchez), the process consists in adding an alkaline earth (calcium, barium or strontium) hypochlorite, phosphoric acid and a phosphate, oxalate or borate to the syrup. The phosphoric acid and the acid salt react with the hypochlorite and the ash-forming constituents of the syrup to form a flocculent precipitate.

The impurities and the added acid and salts are thus carried down as sediment, so that the bleaching action of the hypochlorite is accompanied by a refining effect. The syrup does not need to be hot. Preferably it should be slightly alkaline rather than acidic for the treatment. Chlorine remaining from the added hypochlorite is easily removed either by adding a little hydrogen peroxide or by filtering the syrup through bone char or some form of activated carbon.

Detecting Adulteration In Maple Sugar

IN NEW ENGLAND AND CANADA the adulteration of maple sugar with cane sugar is detected by determining the lead value (the percentage weight of precipitate from 5 grams of dry maple sugar dissolved in 20 cubic centimeters of distilled water and treated with 2 cubic centimeters of lead acetate solution, density 1.25). The lead value of maple sugar is always between 1.75 and 7.5, whereas refined cane sugar gives so little precipitate that it is considered as having no measurable lead value. But the situation with raw cane sugar is very different. Tests with 22 samples, all from different sources in the East Indies, West Indies and elsewhere, revealed lead values all the way from 1.38 to 12.45. Exactly half of the 22 raw cane sugars had lead values in the same range (1.75 to 7.5) which is known for

maple sugar. Of the other eleven samples, five came above the upper limit and six below the lower limit for maple sugar. Hence it is plain that the purchaser of maple sugar cannot rely on lead value as a means of detecting adulteration with raw cane sugar even though the test is quite dependable for refined cane sugar.

Digest from "Lead Values of Maple and Cane Sugars," by Paul Riou and Joachim Delorme. *Comptes rendus de l'Academie des Sciences*, 202, 1941, 1936. (Published in France)

BEVERAGES

Sterilize Beverages Without Pasteurization

ORIGINALLY DESIGNED for the filtration and de-germination of wines, "Cold Sterilization" is coming into use for a host of other liquids, the latest being in the production of non-alcoholic fruit juices. Although highly susceptible to spoilage by infection their keeping quality can be prolonged for months by this method. In Germany, where this type of ultra-filtration originated, it has found diversified application, including the supply of sterile water for dairies, mineral water factories and other food plants. Also it has practically eliminated cider spoilage and has effected great savings by making possible the recovery of "rest" beers and the removal of slight infections from beer, wine, fruit juices and other beverages and liquids. In many instances sterile filtration combined with sterile filling operations has taken the place of pasteurization with the additional advantage of preventing changes in flavor and color and of preserving the vitamins.

Cold sterilization gained commercial practicability with the introduction of the EK filter, (Seitz), EK being derived from the German word *entkeimen* which means to de-germinate. After removing coarse particles by rough pre-filtration, sterilization of the liquid is effected by filtering through specially prepared filter sheets which are thrown away after their filtration capacity is exhausted. The filtration effect can be varied from clarification to complete sterilization by using filter sheets of different size and composition adapted to the performance required. These filter sheets are light in weight and interchangeable and can be used from both sides—a new feature in filter material. The entire equipment can be readily reversed to serve ordinary filter purposes. Before undertaking the actual filtration, the filter is sterilized with steam or SO_2, then rinsed and cooled with sterile water.

To maintain the sterility of the filtered liquid shipping containers and filling operations must be eliminated as possible sources of infection. Machinery has been developed which permits the sterilization and filling of kegs in one operation. A sufficient amount of liquid SO_2 is injected into the barrel where it evaporates immediately and covers the wet walls with a film of saturated SO_2. The dosage of the gas is automatically regulated by the size of the keg (20 to 40 g. SO_2 per bbl.). After sterilization (15 sec.) the keg is blown out with sterile air until only minimum traces of SO_2 remain (45 sec. –0.5 to 1 mg. per 1 volume). Filling operations are carried out against a counterpressure of sterile air or CO_2. All parts of the racker coming in contact with the SO_2 gas are constructed of acid proof material.

In bottling, sterilization and filling are separate operations. A completely automatic bottling unit handling 300 to 400 bottles per hour consists of sterilizer, filler and crowning machine. This equipment works on the same principles as the keg racker. The sterilization of kegs and bottles can be speeded up by exposing the container to higher concentrations of SO_2 for three to four seconds. In this case it is necessary to remove the disinfectant from the containers before use.

Digest from "About Sterilization and Sterile Filling," by A. Schmal. *Schweizer Brauerei-Rundschau*, 47, 221, 1936. (Published in Switzerland.)

Corn Steep Water Source of Protein for Beer Making

USE FOR STEEP WATER BYPRODUCT from cornstarch manufacture has been found in the making of beer, according to a patent claim by Howard File, Decatur, Ill.

Solids extracted from corn during steeping with warm water acidified with sulphur dioxide run about 6 per cent based on weight of corn extracted. Concentrated by evaporation under reduced pressure the liquid becomes 60 per cent solids and 40 per cent water. These solids are about 50 per cent water soluble hydrolyzed proteins or amino compounds. Remainder consists of soluble carbohydrates, organic salts, and inorganic salts. Starch may be added and gelatinized to increase fermentability.

The concentrate is added directly to the wort just prior to fermentation without preliminary acid hydrolysis or peptonization. Its use is cited as a solution of the problem of getting a finished beer with a relatively high soluble protein content. The protein content is claimed to remain soluble over a long storage period.

Through variations in amount of gelatinized starch in steep water concentrate the alcoholic content in the beverage may be controlled.

Details of use of the steep water are covered in U.S. Patent No. 2,068,738 granted Jan. 26, and assigned by Howard File to A. E. Staley Mfg. Co., Decatur, Ill.

MISCELLANEOUS

Denaturing Salt

IN THOSE COUNTRIES which assess a tax on table salt there is an ever-present problem of enforcing the tax law. Tax-free industrial salt must be denatured if bootlegging is to be prevented, yet the denaturants must be acceptable in the uses to which the salt will be put. They necessarily must also be substances which are not easily and cheaply removable from the salt. As an example, Germany has officially recognized 0.25 part mineral oil, 0.25 part iron oxide and 1 part soap per 100 parts salt as a general denaturant mixture, but recently economic conditions have made soap an undesirable ingredient. A new denaturant has therefore been approved, namely: 0.0005 part Chicago Blue 6B, 0.02 part Heliotropin and 2 parts sodium carbonate per 100 parts salt. Aside from this general denaturant, a number of special denaturants are officially permitted for special industrial purposes. These include sodium sulphate, certain dyes, alum, and crude oil among others.

Digest from "New Denaturants for Tax-Free Salt," by Franz Dietrich, *Zeitschrift für die gesamte Kälteindustrie*, 44, 17, 1937.

Antimony In Food Poisoning

ANTIMONY is a metal not used to a large extent in American industries other than in type metal for printing, grids for storage batteries and the compounding of red rubber goods. Yet, from time to time, antimony has been found to be associated with food poisoning, though not a great deal is known about it.

Antimony has been found to be an ingredient of certain cheap, enameled cooking utensils. In Baltimore the investigations of a food poisoning outbreak led to a study of the possible amount of antimony that could be absorbed from the enamel of certain cheap cooking utensils by sauerkraut, an acid food. The kraut could extract approximately one-fourth of an emetic dose of antimony, calculated as tartar emetic.

The authors advise against the use of enameled cooking utensils containing antimony compounds in the enamel for storage and preparation of acid foods until more definite knowledge is available about the safety of antimony in this use.

Digest from "Antimony in Food Poisoning," by E. Kaplan and F. A. Korff, Baltimore City Health Department. *Food Research*, 1, 529, 1936.

Food Equipment News

REVIEW OF FOOD PROCESSING EQUIPMENT, ACCESSORIES, AND SUPPLIES

Small Colloid Mill

LABORATORY EQUIPMENT Co., 146 Lafayette St., New York, N. Y. are marketing a laboratory colloid mill with a working range from 4 oz. samples up to 15 gal. per hour. Equipped with a ½ hp., single phase a.c., 3,600 r.p.m. motor, the mill has a rotor speed of 20,000 r.p.m. The gap is adjustable by a dial calibrated in thousandths of an inch. Water cooling is used. An air release on the grinding chamber makes it possible to force out all air while filling, thus avoiding foaming when operating. The mill is made of corrosion resisting materials.

Can Cleanser

FOR USE IN CAN WASHERS, Diversey Corp., 53 W. Jackson Blvd., Chicago, Ill., announces "Novex," a new addition to its line of cleaners and sterilizers for food plants. This cleanser has been developed solely to give satisfactory results in the washing of cans and to keep the can washer in such condition that it can operate at its maximum efficiency.

Process Cycle Controller

BRISTOL Co., Waterbury, Conn., has developed a process cycle controller, Model 6088V, for use where variable speeds are required. This instrument is said to control automatically any cycle operation which operates on a cycle that must be changed from time to time.

Belt for Food Plants

VICTOR BALATA & TEXTILE BELTING Co., 53 Park Place, New York, N. Y., have recently brought out "Foodtex" belting, for conveyors in food plants. This belt has been developed specifically for food conveyors and is said to be odorless, tasteless, waterproof, highly resistant to fruit acids, easy to clean, and to have long life.

Portable Filter

T. SHIRVER & Co., Harrison, N. J., has developed a small portable complete filtration unit. It consists of a Shriver plate and frame type pressure filter of as many chambers as may be required, a Shriver diaphragm pump, a direct connected ¼ hp. motor and a starting switch, all mounted on a portable stand on roller bearing casters. The filter in the picture has eight chambers and is for capacities up to 90 gal. per hour. Overall dimensions are 35x16 in. The filter can be supplied in materials suitable for the liquid being filtered.

Portable Mixing Unit

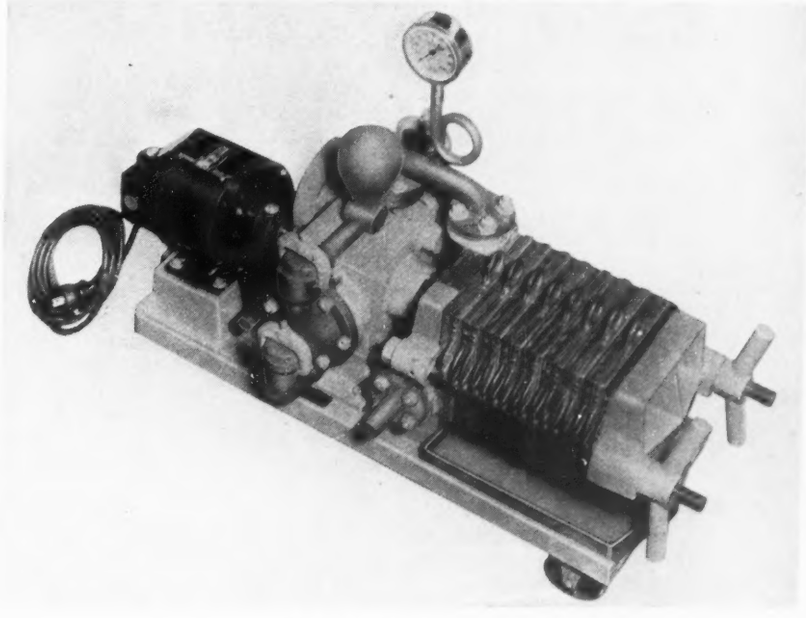
THE "LIGHTNIN" PORTABLE MIXING UNIT has been developed by Mixing Equipment Co., Rochester, N. Y. It can be moved either on a truck or on casters, avoiding the use of considerable piping, as it is spotted first at one job, then at another. The motor is mounted on the machine, so that it can be plugged in wherever convenient.

In this mixer the agitator is so placed as to give a double mixing action —complete rotation plus bottom to top turnover. The mixer housing serves as a baffle to increase mixing efficiency. The unit is available with 100, 300 and 600 gal. tanks.

"Stero-Vac" Canning Machine

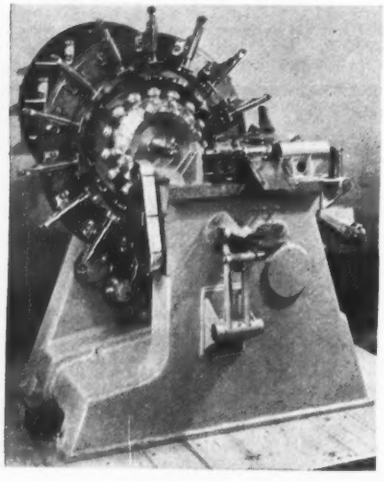
A PROCESS, and the machine to carry it out, for commercially sterilizing products in the can and in the practical absence of oxygen, has been developed by Crown Can Co., Erie Ave. and H St., Philadelphia, Pa. The machine is illustrated in the accompanying photograph. It consists of a rotating turret, carrying headers with which the cans are held in contact under spring tension. As the turret revolves, the cans complete a full circle, so that each can is turned upside down. During this revolution, the header is held against the can so that its central opening coincides with a valve in the can end.

Containers are filled in the customary manner and the valve end is seamed on, as usual. The valve, a floating disk, is still open when the can goes to the "Stero-Vac" machine. The cans are fed automatically into the machine at the bottom of its rotation, so that the can valve is in contact with the header opening. As the can starts on its passage through the machine, a high vacuum is applied through the header. This vacuum is first applied when the can is in an upright position. It con-



Portable filtering unit.

tinues to be applied as the can tilts, until the liquid contents almost reaches the valve. At this point vacuum is cut off and steam is injected directly into the can, through the header and can valve. By this time, the can has tilted sufficiently to bring the liquid into contact with the valve, where it is violently agitated by the entering steam and heating of the can contents is rapidly accomplished. Steam con-



"Stero-Vac" machine for quick heating of canned foods.

tinues to enter until the turret has made three-quarters of a complete revolution, when the can is automatically lifted off the header. The pressure within the can forces the valve disk against a sealing compound, temporarily sealing the can. Permanent sealing is carried out by a clinching unit on the machine which compresses the metal below the disk, locking it against the sealing compound.

This machine and process of canning was particularly developed for use with fruit and vegetable juices. On fruit juices, the complete cycle on the machine takes 10 seconds. The temperature of the juice in the can is raised to 210 deg. F. The cans are then immediately cooled, resulting in a final vacuum of about 22 in. Capacity of the machine is 85 cans per minute.

Since the heating in this process is carried out by injecting steam into the can, the can contents is diluted by the steam condensation. In the case of fruit and vegetable juices, it is necessary to compensate for this dilution. This is done by running the juice through a deaerating process where it is continuously boiled under a high vacuum. This removes the oxygen, most of the other gases, and an amount of the water equivalent to the water later added by steam condensation. This step in the process is said not to change the quality or flavor of the juice, as it is carried out at temperatures around 100 deg. F.

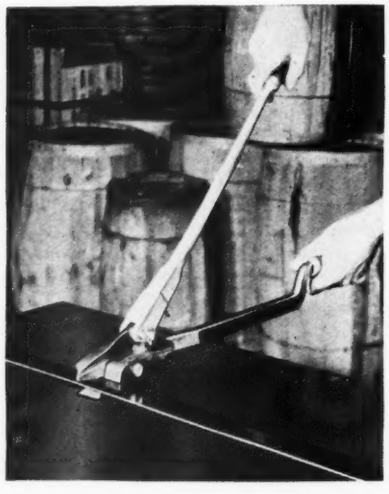
The "Stero-Vac" process has been applied to citrus fruit juices, tomato juice, evaporated milk, whole grain corn, peas and lima beans.

Diesel Engine Trucks

DIAMOND T MOTOR CAR CO., Chicago, Ill., recently introduced two new models which are claimed to be the first light weight, high speed Diesel trucks ever put into production. Sizes are 1½—3 ton, Model D 20; and 2½—4 ton, Model D 30.

Shipping Case Tool

A SHEAR for cutting flat steel bands has been developed by the Acme Steel Co., 2836 Archer Ave., Chicago, Ill. This is for use by shippers and receivers, in cutting ¾ and 1¼ in. steel bands used for strapping shipping cases.



Shear for cutting steel shipping case straps.

Checkless Lift Truck

A HAND LIFT TRUCK of 1 ton capacity, embodying a new principle of safe and easy operation, has been developed by Barrett-Cravens Co., 3255 West 30th Street, Chicago, Ill. For lifting loads, there is no foot treadle to manually engage, action being automatic. When the handle is pulled down, the load is raised. The load is lowered by first stepping on a release treadle, then lowering the handle to fully disengage the latch. From then on, the load is controlled downward by the operator through his grip on the handle.

This truck is available in 6, 7, 8 and 11 in. heights. Lift is 2 in. Width of frame is 18 or 24 in. Length of frame is 24 to 72 in.

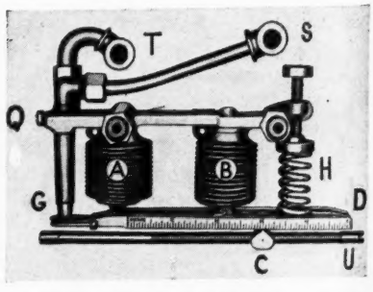
Leak Stoppers

M. B. SKINNER Co., South Bend, Ind., has redesigned its well-known line of clamps for stopping leaks in pipe lines. These clamps are now made of metal of higher tensile strength, more uniform density and greater hardness. Also, as an additional safeguard, all clamps are now tested at a pressure of 3,000 lb. before shipment from the factory. Clamps are made for stopping leaks in air, steam, ammonia, brine and other types of pipelines.

Universal Controller

ARCA REGULATORS, INC., 53 Locust Ave., Bloomfield, N. J., are manufacturing a controller that can be adjusted over a wide range to operate in controlling temperature, pressure, vacuum, level, flow, speed, or any other process variable which can be made to give a variable pressure impulse.

Reference to the accompanying illustration shows how this device operates. *A* and *B* are metal bellows attached to a stationary support at their upper ends, and pivoted to the bar *D* at their lower ends. Bar *D* pivots on fulcrum *C*. When a difference in pressures is the actuating means, as in flow control, both bellows are used and the fulcrum is moved to a point between them by means of the screw *U*. For such variables as temperature, pressure and vacuum, which can be controlled by a



Universal Controller with case removed.

pressure impulse in a single bellows, the fulcrum is placed in some position to the right of *B* and the second bellows becomes a compensator that prevents hunting. Bar *D* carries a flapper which, in contact with air nozzle *G*, serves to regulate the air pressure on a diaphgram control valve and hence controls the valve opening. The movement of the flapper for a given pressure change can be adjusted by varying the location of the fulcrum. This makes the controller adjustable to suit the different requirements of various operations.

The makers state that this controller has an adjustment range that is wider than that of any other instrument on the market.

Lamp for Local Lighting

FOSTORIA PRESSED STEEL CORP., Fostoria, Ohio, has developed the "Unifocal" lamp, for use where a localized lighting of intense character is de-

sired. The reflector is of spun aluminum and is designed to reflect the light rays into a converging beam that brings the light to a focus 15 in. ahead of the reflector. The result is uniform and intense illumination over a restricted area, but without glare because of effective shielding of the light source. The lamp has a supporting arm that permits directing the light in any direction at any angle. An oil-resisting light cord is carried inside the arm, and a lever switch is mounted on the handle grip on the reflector.

V-Belts for Pivoted Motor Drives

ROCKWOOD MFG. CO., Indianapolis, Ind., have developed a complete line of V-belt equipment, including cast iron and steel sheaves and rubber V-belts. These are now being supplied on this concern's pivoted motor bases. This combination is said to give constant belt tension in spite of any stretch in the belts. Also, with the pivoted base, tension is released when the drive is not in use, prolonging the life of the belt.

Truck Casters

THE "LO-WATE," in swivel and rigid types, is a new design of truck caster brought out by Divine Bros. Co., Utica, N. Y. In this caster the top plate and fork are alloy iron castings. Chrome nickel steel ball bearings are used in the swivel. Parts are rust-proofed by Parkerizing and have a dull black oil finish. Metal, canvas cushion, molded plastic or rubber wheels are available. All non-metallic or Hyatt bearing equipped wheels have a nut and bolt

"Lo-Wate" truck caster.

axle with steel spanner bushing. Plain bored iron wheels have a rivet type axle bolt.

Steam and Water Mixer

SARCO CO., INC., 185 Madison Ave., New York, N. Y., are manufacturing a new design of steam and water mixing valve for use in producing hot water for food processing and other purposes. By automatically controlled proportioning of the steam and water being mixed, the mixer supplies water at any temperature for which it may be set. It consists of a three-way valve, a water injector and a temperature regulator, combined in one unit. It is available in capacities from 80 to 1,400 gal. per hour, for steam pressures from 25 to 150 lb. per sq.in.

New Cab-Over-Engine Truck

WHITE MOTOR CO., Cleveland, Ohio, is building a new design of cab-over-engine truck, suitable for food hauling. Claims for this design include improved safety on the highway, handling ease in traffic and shortest possible overall length. The over-all height is very near that of a conventional truck. This, combined with wide tread axles, gives a very low center of gravity, increasing stability on the road.

Explosion Tested Motors

A NEW DESIGN, Type SK, of explosion tested, fan-cooled, totally inclosed d.c. motors has been developed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These motors are built to withstand an internal explosion of gas or dust without injury and without emitting flames or sparks which could ignite combustible material in the surrounding air. They are available in sizes from 5 to 75 hp., at 115, 230 and 550 volts.

Vibrating Barrel Packer

AN ELECTRIC VIBRATING BARREL PACKER of low head and high capacity (up to 800 lb. gross) is announced by the Jeffrey-Traylor Division of Jeffrey Manufacturing Co., Columbus, Ohio. Standing only 16½ in. high, it requires

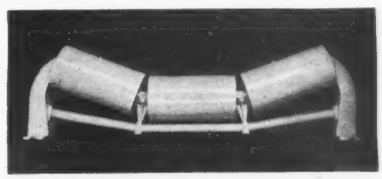
Vibrating barrel packer.

only a shallow pit for floor level operation. As it can be installed water tight by using a rubber skirt connecting the outer circumference of the head with the edge of the pit, the packer may be washed down with a hose without fear of wetting the electrical parts.

The head is circular, 30 in. in diameter, and provided with either a ring or lugs to fit any container up to its maximum diameter.

Belt Conveyor Carrier

A "TRUSS-FRAME," sealed ball bearing belt conveyor carrier of light, strong and comparatively inexpensive construction has been developed by Stephens-Adamson Mfg. Co., Aurora,



Light weight truss frame belt conveyor carrier.

Ill. This carrier is of the three-roll in line design with the outer rollers inclined to give the belt a 20 deg. trough. The whole roller assembly is tilted so as to center the belt without guide rollers. Rollers are of 5 in. diameter steel tubing with ends rounded over the pressed steel end plates to prevent fraying of the belt. Roller ends are recessed to house the bearings and allow rollers to be closely spaced so as to avoid danger of pinching belts. Renewable, cartridge type ball bearings are used. The truss frame is light and rigid, with the load carried by a tension rod.

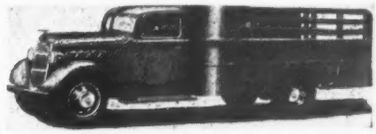
Everlasting Record Chart

RECORDING INSTRUMENTS can be supplied with permanent recording charts through a development made by Permochart Corp., 295 Madison Ave., New York, N. Y. The "Permochart" has a hard surface, from which pen recordings can be removed by means of a dampened cloth.

This chart is for those applications where a daily record is required, but where record charts are not filed for future reference. It is claimed that its use, in such cases, gives an average saving of 85 per cent over the cost of paper charts.

Perishable Food Truck

GROCERY SUPPLIERS, fruit growers, bakers and those handling other perishable produce needing quick transport will find a speedy and economical truck in a design recently brought out by Reo Motor Car Co., according to that concern. This truck, shown in the



Delivery truck for perishable foods.

accompanying illustration, is available in ½-ton and ¾-ton models, and 114 and 120-in. wheelbases. It is equipped with all-steel cab and safety glass. The model is called the "Reo Speed Delivery."

Just Off The Press

BOOKLETS • LITERATURE • BULLETINS

Food Plant Equipment

1. CENTRIFUGAL SEPARATORS—"Centrifugal Force" is the title of a bulletin on the design and application of centrifugals for the separation of food products and other materials.

2. CONVEYOR CHAIN — Handling chains of various designs are illustrated and described in three new folders.

3. CONVEYING EQUIPMENT—Portable pilers for bags, bales and containers of food materials and other products are illustrated and described in a bulletin called "The Key to Greater Profits."

4. HUMIDITY AND DRYING CONTROL —"Wet and Dry" is a 40-page catalog of control methods and equipment for controlling humidity in processing, drying and storage of food products.

5. MAGNETIC SEPARATION—Removal of iron or iron bearing minerals from foodstuffs by drum-type magnetic separators is described and shown in a recent bulletin.

6. SCREEN AND FEEDER DRIVE—"Ajax" reciprocating drives for screens and feeders in food plants are discussed in a bulletin illustrated with drawings.

Plant Accessories and Supplies

7. BOILERS—Large steam generating equipment for use with various fuels, including industrial wastes and waste heat are described and illustrated in a 24-page bulletin.

8. FISHING BOAT ENGINES—Diesels for fishing boats and for industrial installations are shown in sizes from 10 to 2,400 hp. in an illustrated bulletin.

9. HOSE—Rubber hose and accessories for food plants and all other purposes are described in a 48-page illustrated catalog.

10. LIGHTING — "Factory Lighting Practice" is the title of a bulletin discussing 30 lighting problems commonly found in industrial plants.

11. LUBRICATION EQUIPMENT — "Alemite Controlled Lubrication" is the title of a 56-page catalog of pressure lubricating equipment for processing equipment and other industrial purposes.

12. PIPE MACHINES—Threading and welding equipment for use in making industrial and other piping installations are shown in a 76-page loose-leaf catalog.

13. POWER PUMPS—For handling viscous liquids and for constant capacity at varying heads, a line of duplex, standard service and heavy duty power pumps are the subject of a 12-page bulletin.

14. PUMPING EQUIPMENT — "Engineering Data and Prices" is the title of a 233-page general catalog of centrifugal pumping equipment which gives applications, installation data, engineering data, specifications and prices.

15. RUBBER GOODS—Hose, tubing, belts, packing and many other forms of mechanical rubber goods used in food plant are described in a 27-page illustrated catalog.

16. SILENT CHAIN DRIVE—"Silverstreak" silent chain drives for production equipment are specified and described in a new 96-page data book.

17. SPEED REDUCERS — "Powered Gears," speed reducers from 1/50 to ¾ hp., in ratios from 2 to 1 up to 8,000 to 1, are described in a bulletin giving selection and price tables.

18. STEAM TURBINES—High pressure process work steam supply can be combined with power generation through the use of non-condensing turbines described in a recent 20-page illustrated bulletin.

Truck, Tractors, and Accessories

19. TRUCK BATTERIES — The new "Kathanode" batteries for food and other trucks are the feature of a 24-page catalog of storage batteries for trucks.

Pest Control

20. PEST CONTROL—How to get rid of insect pests in the milling industry is the subject of a 16-page illustrated bulletin.

Laboratory Equipment

21. PHOTOELECTRIC CELLS—Laboratory apparatus and methods employing photoelectric cells and associated equipment are described and specified in a new bulletin.

22. PORTABLE pH METERS—pH determinations in food plant and research work can be made with the two models of portable pH meters described in a recent bulletin.

Food Ingredients

23. FOOD PRESERVATIVE—Benzoate of soda regulations vary from State to State, as shown by a recent resume of Federal and State laws bearing on its use in food products.

Raw Food Materials

24. VEGETABLES FOR CANNERS—Descriptions especially prepared to give information concerning vegetable seeds of varieties used by canners are featured in 48-page special catalog of a seed house.

Materials of Construction

25. CORROSION RESISTANT MATERIAL—"Strength Plus" is the title of a 48-page illustrated catalog of applications of "Monel" metal.

G. L. Montgomery, Managing Editor, Food Industries, 330 W. 42nd St., New York, N. Y.

April, 1937

TO THE READER: Use this convenient form to order the bulletins you need.

Please obtain for me the bulletins indicated by the following numbers:.....

.....

Name.....

Title.....Address.....

Company.....

THEY'RE AFTER YOUR MARKET

Uses Current News Angle. Standard Brands has distributed among 30,000 bakers of the country a pictorial broadside picturing the company's activities in the flooded Ohio River Valley. Titled, "A tribute to Fleischmann representatives who constantly serve the baking industry," it tells a graphic story of the determined and successful efforts made by the company and its employees to continue deliveries of Fleischmann's Yeast and Chase & Sanborn coffee wherever needed. The company points to its efforts to uphold its 80-year record of regular food deliveries.

Jello Display Stand Wins. Honors in the Wolf Award Package Competition for the best floor display were given to General Foods' Jello's floor stand. In the dispensing tray an orderly effect is given to the units in each row, but the undesirable appearance of regimentation is avoided by a series of set-back steps which relieve the uniformity of the rows.

Paper Package Handle. From the Leipzig Trade Fair, Leipzig, Germany, comes an unusual modification of the gummed tape idea. It is the product of Oscar Kind Co., Ges. M.B.H., Koln-Rodenkirchen, Germany. At regular intervals this gummed paper is slotted to allow a fiber ribbon to protrude from the under side to form a handle. The tape is fed from rolls and moistened in a manner similar to that used in this country. When applied to a package, it serves as package fastener, provides a handle for carrying and in some cases saves the cost of wrapping.

Point of Use Display. Who that rides the street railways or reads the general magazines is not familiar with the gay-colored "Gulden Mustard" advertisements. Who cannot remember the appetizing dishes and their recipes suggesting many mustard uses. Charles Gulden Co., New York, has applied this colorful motif to point-of-sale and point-of-use display by reproducing the dishes and recipes in miniature on the container caps. In carton or other mass display these caps have the "take me home and save the recipe" appeal. In the home each of the different color-lithographed caps suggests an appealing dish prepared with mustard as an ingredient. Guldens is an excellent example of using the package itself to do a good advertising job at the point of use as well as the point of sale. It carries the continuity of advertising to the finish line.

It's the Manufacturer's Turn. National Association of Food Chains has successfully promoted the sale of several surplus crops. It now promises to, and no doubt will, relieve the market of the over-production of Bartlett pears. The chain stores of Florida have organized as the Florida Chain Store Association to study and put into effect the best methods of advertising and marketing local crops. They hope to improve public relations, especially with the agricultural groups. I.G.A. in a recent bulletin suggests to independent produce wholesalers that they "compare what the corporate groups are doing with what we independents are doing . . . and take a lesson from our corporate competitor, the chain, who has made itself increasingly popular with the public." The manufacturer is between producer and distributor. Can he afford not to make a stronger bid for improved public relations?

A Shift of Advertising Focus. Recently a few food manufacturers have departed, at least temporarily, from the usual custom in advertising, of wrapping their product in layers of transparent superlatives. These few advertisers are concerned with other vital issues. They mention their product only casually if at all. Not a few advertisers are attempting to establish better public relations through institutional copy, and now Best Foods Co., New York, is carrying the margarine issue to Congressmen and the people, via numerous advertising mediums, in an institutional campaign separate from its regular product advertising. Possibly consumers will find a freshness in this copy which will be reflected in sales as well as the accomplishment of the purpose behind the copy.

Related Item Display Gains. Cheese and macaroni manufacturers' associations and wine vintners are jointly requesting the retailers they serve to display posters, recipe books and other advertising material featuring the use of the related items, macaroni, cheese and wine. An improvement in annual sales is expected from this campaign. National Biscuit Co. has, during the last year, associated jams, jellies, cheese, peanut butter and other related items with "Ritz" crackers in point-of-sale displays. It has also encouraged retailers to associate these items together in package displays. Companion items wherever so displayed are said to have enjoyed increased sales. Ritz cracker sales increased slightly better than 10 per cent last year.

Best Packages for 1936

in Wolf Award

OUT OF THE 800 CONTESTANTS for the Wolf packaging awards, food products captured twelve places in the twenty different classifications.

The Morrell Pride family entered by John Morrell & Co. and the food products family entered by National Tea Co., using natural color photos of product on label, (FOOD INDUSTRIES, November, 1936) both took honorable mention in the family classification. Awards were made in this classification for the most effective family of packages—a group of packages of related design for different products made by the same manufacturer. One of the Morrell family, the package for ox tongue, merited honorable mention in the most effective redesigned-package classification. Awards in this classification were based on the comparison of the old package with the new. The Morrell packages obtained three honorable mentions. The third was awarded for the most effective use of layout or decorative design with particular emphasis on both merchandising value and beauty of the package.

Two awards were given to another food product, Bakon Yeast (FOOD INDUSTRIES, April, 1936). One of these awards was for the most effective package employing a secondary use. Selection in this classification was based on packages designed to appeal to the consumer because they

..Food Winners

Packaging Competition

may be used for another purpose after the original contents have been removed. The second Bakon Yeast award was for the most effective package employing a single color.

Honorable mention went to Andes Candy. The award was made for the most effective use of more than one color, whether multiple-color printing or a combination of colored materials.

The awards for the most effective use of the elements of design to create shelf visibility in retail stores went to Nutwood Ham, a product of Cudahy Packing Co.

Honorable mention was given Gerber Products for the shelf rack in which Gerber baby food products are displayed. This award went to the counter-display that most effectively contributes to the selling of a unit package.

Both awards for floor displays went to food products companies. General Foods took first place with its display of Jello. Honorable mention went to the "K-Man" floor stand, used for the display of Krueger Brewing Co.'s products. One award for the most effective use of inventive genius in package construction was given to Wonder Pack, used by Molded Products (Food Industries, July, 1936). The Wonder Pack comprises wax packages shaped like oranges and lemons and containing orange and lemon beverage powders.

BUSINESS TRENDS

Commodities Soar Again

AFTER REACTING in mid-February, then steadying, commodity markets seem to have entered another period of fluctuation and speculative advance. Early in March, Fisher's index was 91.1, compared to 91.0 two weeks before and 90.4 in the first week of February. In the second week of March, war-influenced foreign buying became important enough to cause definite recovery in American markets, particularly for grains, cocoa, fats and oils. By the tenth of the month, speculation was merrily at it again, with heavy profit-taking immediately following. The N. Y. *Journal of Commerce* reported its commodity price index at 91.7 on March 15, with foods showing an 8.4 per cent rise since the last week of October, 1936, and a rise in grain prices for the same period of 7.2 per cent.

As long as commodities are affected by European buying against war contingenices, it is likely that the price level will continue its upward trend, except as it meets normal seasonal influences.

Meat Hits Ceiling

RISING PRICES FOR LIVESTOCK in Chicago during March brought levels to the highest for the season. Best steers sold around $15 per hundred, and lambs reached $11.75, the highest March price since 1929. Hogs at over $10 compared to a five-year average of $6.45. Receipts were relatively low, That, with increased buying power, was said to be the reason for the price level.

Construction News

	Pending (thousands)	Awarded March (thousands)	Total Awarded 1937 (thousands)
Bakery	$730	$120	$344
Beverages	765	1,070	1,872
Canning and Preserving	180	40	40
Confectionery	....	....	....
Grain Mill Products	300	564	1,121
Ice Manufactured	160	....	85
Meats and Meat Products	80	740	1,010
Milk Products	2,120	1,505	2,182
Miscellaneous	1,420	560	2,020
	$5,755	$4,599	$8,674

In contrast, wholesale meat prices remained relatively steady. Dressed beef ranged from 10 to 19 cents per pound, compared to 10 to 15½ cents the year before. Fresh pork loins were quoted at 16 to 20 cents, compared to 16½ to 20½ cents the previous year. Lamb prices, at 13 to 18 cents per pound, showed only a slight rise from the 13½ to 16 cent levels of March, 1936.

Poultry, fish, eggs and cheese are all in abundant supply at relatively low prices. It is evident that meat prices have again touched a ceiling, caused by prices of substitute protein foods.

Fats and Oils Higher

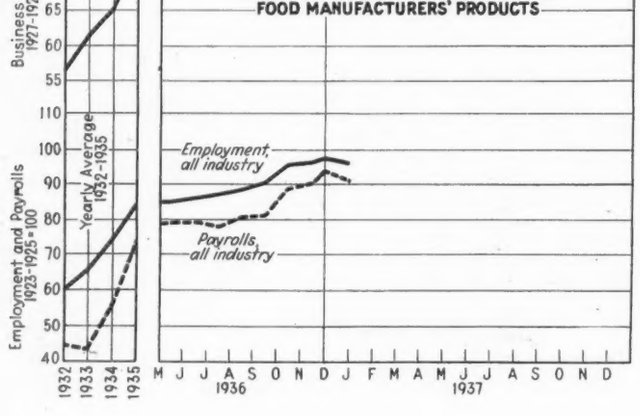
PRICES OF FATS AND OILS continued a general upward tendency in March. Demand in Europe was strong, perhaps, as was the case with some other commodities, because certain countries are laying in stocks against the possibility of war. In the United States, demand for these products continued strong, prolonging a tendency evident in both 1935 and 1936, when domestic consumption of fats and oils, excluding lard and butter, reached new heights, with 5,300,000,000 lb. disappearing in 1935 and 5,569,000,000 lb. in 1936. Figures available for January indicated that demand was still high, with 312,503 bbl. of cottonseed oil moving into consumption during that month, compared to 190,825 bbl. in January, 1936.

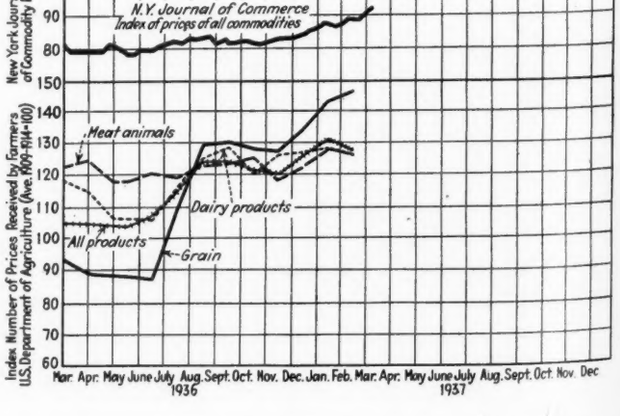
When consumption of lard and butter is included, the figures for U.S. apparent disappearance of all fats and oils, as given in the March, 1937, report of the U.S. Bureau of Agricultural Economics, present the following picture:

1929	8,964 million pounds
1930	8,592 million pounds
1931	8,496 million pounds
1932	8,174 million pounds
1933	8,298 million pounds
1934	8,573 million pounds
1935	8,747 million pounds
1936	9,148 million pounds

It will be seen that the trend has been sharply upward since the low point of 1932. The Bureau expects this trend to continue through 1937. With European demand continuing strong, some additional price rise may occur.

One interesting feature of the oil and fat situation is the continuation of relatively high prices of coconut oil and copra. If it is true that copra producers are holding large stocks off the market, the price might be accounted for that way. At any rate, copra supplies remain below normal. Perhaps the output has fallen off, as has been suggested in some quarters. Copra




TRENDS OF PRICES PAID BY FOOD PROCESSORS FOR RAW MATERIALS
New York Journal of Commerce Index of Commodity Prices (Av. 1927-1929=100)
N.Y. Journal of Commerce Index of prices of all commodities
Index Number of Prices Received by Farmers U.S. Department of Agriculture (Ave. 1909-1914=100)
Meat animals
Dairy products
All products
Grain
Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec
1936
1937

Business Wavers

PRESSURE OF LABOR DISTURBANCES, aided by flood damages and political maneuvering has kept the curve of business activity in a seesaw movement during the past month. After a slight upturn during the last two weeks of February, the *Business Week's* index of business activity has taken an equal downturn during March. At a level of 79.3 per cent of "normal" for the week ending March 20 this index shows no change for the four-week period.

Steel production, bituminous coal output, carloadings, and commodity prices continue on their upward way. Automobile output has been hit particularly hard by strikes. Loss of millions of man-day labor wages has had a depressing effect upon the volume of business done in consumer products. However, prices in retail stores as well as in bulk commodity markets continue to show a definite trend upward.

According to U.S. Department of Labor reports, wholesale prices for all commodities have moved up 1.87 per cent during the month ending March 13. Farm products prices advanced 2.18 per cent while those for food are 0.81 per cent higher. For the month ending March 20 the weighted price indexes of the New York *Journal of Commerce* moved up 4.28 per cent on a general basis. During these four weeks the index of grain prices advanced 0.80 per cent and that of food prices climbed 4.19 per cent.

imports into the U.S. in 1936 were only 364,493,443 lb., compared to 454,134,203 lb. in 1935, as reported by the U.S. Department of Commerce.

Another feature of the oils and fats situation is the 1937 outlook for olive oil supplies. U.S. Consul L. L. Schnare, in Milan, Italy, reported through the U.S. Department of Agriculture on March 12, that indications are that Italy is confronted with a serious olive oil shortage, caused by an unusually small olive crop. There is also a shortage in other Mediterranean exporting countries, whence Italy normally procures supplies for refining for shipment to the United States.

Normally, this country produces only from 1 to 3 per cent of the olive oil it consumes, the balance mostly coming from Italy and Spain. Spanish exports are prohibited. The Bureau of Agricultural Economics, in the light of this supply situation, expects that the supplies of edible olive oil for the United States will be much curtailed during the present season.

More Wine Used

AMERICANS ARE DRINKING MORE WINE than ever before, according to a recent report of the Wine Institute. Consumption in 1936 totaled 60,900,000 gal., compared to 45,950,000 gal. in 1935 and about 30,000,000 in 1934. Per capita consumption has increased from 0.223 gal. in 1934 to 0.475 gal. in 1936. Of this wine, 94 per cent was domestic production, with California the leading producing state and New York, Michigan and Ohio next in order.

Vineyards in the United States at present cover 720,000 acres, of which 525,000 acres are in California. That state also has 640 of the 1,226 existing wineries, and 39 of these have over 1,000,000 gal. annual capacity each. The investment in American vineyards and wineries is now more than $500,000,000.

It is evident from these statistics that American wine making is growing rapidly and assuming increasing importance among the various branches of the food industries. The recent repeal of prohibition in parts of Alabama and other localities forecasts a continued advance for wine in 1937.

Wheat In Demand

WITH BOTH AMERICAN and world wheat stocks rapidly disappearing, and with European demand high, the present levels of wheat prices apparently have a firm basis in supply and demand conditions. On March 1, Chicago estimates of wheat on farms in the United States averaged 87,500,000 bu., compared with about 120,000,000 bu. at that time a year ago. Both domestic and world supplies will be short for the next four months, Broomhall's latest (March 1) estimate for world stocks being only 238,000,000 bu. available up to July 31.

This supply situation, and the persistent demand by Europe's would-be empire builders, have forced wheat prices to seven-year highs. Of course, every time three drops of rain fall in western Kansas at this time of the year, pit traders start enthusiastic bear rushes. But these have had no lasting effect, and the general trend continues firmly upward.

Prospects for the 1937 wheat crop in the United States are good. Some recent Chicago estimates forecast a winter wheat yield of about 630,000,000 bu., in light of the acreage planted and the reputed March 1 condition. Spring wheat estimates are as yet little better than guesses, but now indicate a normal yield of some 250,000,000 bu. This indicated total of 880,000,000 bu. certainly does not forecast any local shortage. But the price level for this wheat will most likely depend on world supply and the world price.

INDICATORS

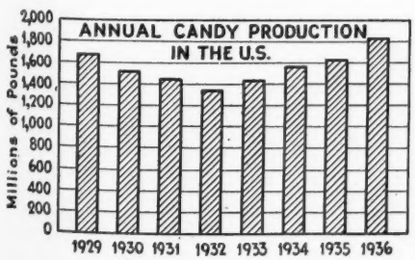
FISH LANDINGS at New England ports in 1936 totaled 414,767,000 lb., valued at $11,144,000 compared to 373,118,000 lb., valued at $9,005,000 in 1935, as reported by the U.S. Department of Commerce.

FISH IN COLD STORAGE in the U.S. on Jan. 15, 1937, equaled 87,503,000 lb., compared to 64,031,000 lb. on Jan. 15, 1936, and a five-year average of 56,563,000 lb., according to the U.S. Department of Commerce.

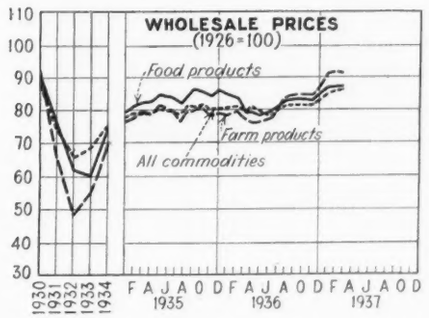
FISH TO A VALUE OF $2,000,000 will be purchased by the government and distributed in relief channels this spring, in accordance with legislation recently passed by Congress.

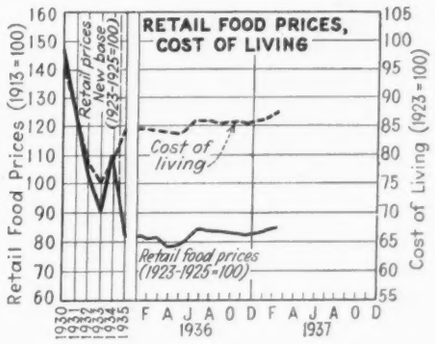
SUGAR OUTPUT, 30,770,000 tons, and consumption, 30,892,000 tons, both hit a peak during the past crop year, according to Dyer & Co.

SUGAR PRODUCTION is expected to pass consumption again in the current crop year, according to an estimate of a 525,000-ton increase in stocks made by Lamborn & Co.



Prices received by farmers are from the U. S. Department of Agriculture. Employment, payrolls, wholesale prices and retail prices from the U. S. Department of Labor. The business activity index is that of *The Business Week*. The cost of living index is from the National Industrial Conference Board. Data on candy production is from the Corn Industries Research Foundation.





Keeping Up WITH THE FIELD

Bakers Discuss Production—Copeland Bill Progress—Patman Act Charges Sugar Bill Lags—Washington Views

Bakery Engineers Meet. Production practices as they affect the merchandising of bakery products were subjects of major discussions at the fourteenth annual meeting of the American Society of Bakery Engineers at Chicago, Ill. Other subjects of discussion on the four-day program, March 8-11, included unusual properties of ingredients, safety of employees, handy shop-made mechanical devices, and influence of children on consumer preferences for foods.

Interest that such a program holds for bakery production men and allied trade representatives is evidenced by the all-time record registration of 966 and the unusually large attendance at all sessions. First-time registrants were conspicuous in number as were the delegations from Canada and the Pacific coast states.

Improvements in palatability were cited as strongest factors in turning upward the consumption curve for bakery products, particularly bread. M. A. Gray, Pillsbury Flour Mills Co., listed the following as points which should be stressed: 1. Use of more desirable flour, 2. correct mixing and machining of doughs, 3. correct fermentation, 4. baking at lower temperatures, 5. freshness, and 6. good toasting qualities.

HEADS A.S.B.E.

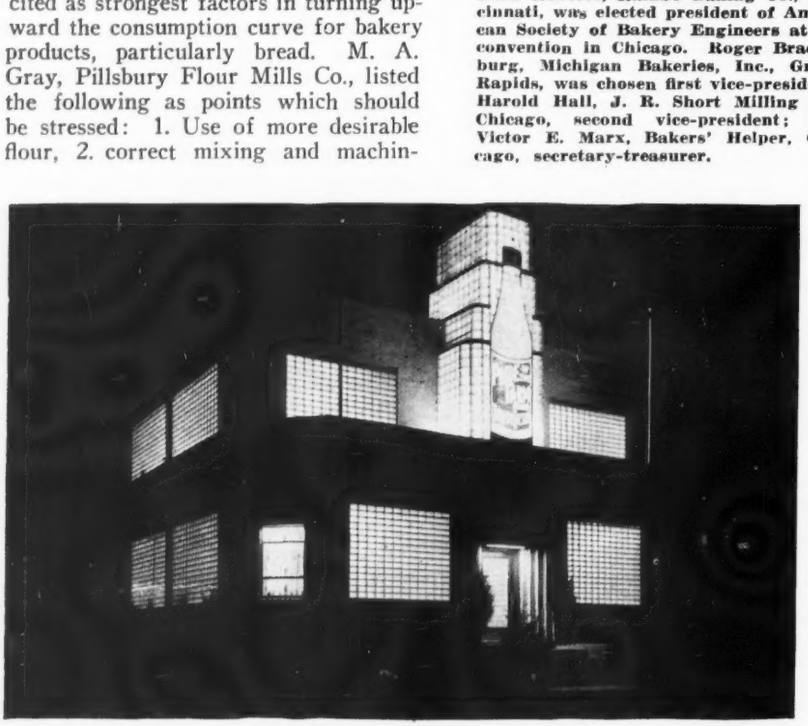
John Roberts, Rainbo Baking Co., Cincinnati, was elected president of American Society of Bakery Engineers at the convention in Chicago. Roger Bradenburg, Michigan Bakeries, Inc., Grand Rapids, was chosen first vice-president; Harold Hall, J. R. Short Milling Co., Chicago, second vice-president; and Victor E. Marx, Bakers' Helper, Chicago, secretary-treasurer.

In support of his plea for better toasting bread Gordon H. Darnell, Paniplus Co., Los Angeles, Calif., recommended the use of increased amounts of milk, sugar, salt and yeast, shorter sponge time with cooler sponge temperature (70 deg. F.) and shorter pan proofing time, open-top pans instead of the closed pullman loaf pan and a well-baking but not over-baking oven time and temperature.

Attention was called to the cooling effect that the use of dextrose or corn sugar has on the sponges and doughs. Reports of tests made with yeast at higher-than-room, room and freezing temperatures showed that freezing does not destroy or weaken yeast while higher-than-room temperatures do.

In addition to discussions on "hot" sponges, malt, flours, flavors and pans, exhibits and demonstrations were made to illustrate the right and wrong ways of preparing sweet doughs and rolled-in coffee cakes.

Just as taste or "palatability" became the slogan for 1936, "flavor" becomes the big word for 1937.



THE LIGHT SHINES BRIGHT

By night, there is a silver lining in the new office building of E. Pritchard, Inc., Bridgeton, N. J. The tower and wall panels of glass block emit a flood of light which has an eye-stopping merchandising value. By day, the light shines the other way, the walls permitting diffused daylight to brighten up the interior and improve working conditions. The office is air-conditioned, and the hollow blocks, with their partial vacuum, retard the flow of heat and aid in controlling temperature. The blocks also muffle outside noise.

Food Bill Passes Senate. There are few important differences between the Copeland Bill (S. 5) which passed the Senate and the bill as introduced early in this session of Congress. (Food Industries, February, page 79). And one of these differences is to the advantage of one branch of the food industries because it permits artificial coloring of butter and cheese without a label declaration. Another change extends false advertising to all representations concerning "the identity, strength, quality, purity, quantity, origin, sources, harmlessness, or safety" of products and their ingredients.

In general, the bill is satisfactory to the food industries, except perhaps for the provision authorizing the Secretary of Agriculture to establish a "reasonable standard of quality," which some believe impracticable. But whether the bill will pass the House in such an acceptable form is another matter. There is every indication that women

representing the interests of consumers will put up a strong fight to strengthen certain protective provisions of the measure. These spokesmen object to the following features of the bill, and these are the points which industry will be called upon to defend:

1. It limits the number of seizures possible for misbranded goods, except in cases where the misbranding renders the product "actually dangerous to health or is in a material respect, false and fraudulent."

2. It provides ineffective control of false advertising. While control by injunction permits quick enforcement, it does not sufficiently deter repeated violation. Furthermore, the bill accords exemption from false advertising charges of those whose representations are supported by "experts."

3. The measure does not authorize multiple quality standards for foods and exempts fresh fruits and vegetables from even a single standard.

4. The act provides court review of regulations under new equity principles which probably will weaken their effect, and it provides unnecessary Administrative review of regulations, the women contend. The wording of the bill provides that the injunction can be used to prevent enforcement of regulations if it is found that the petitioner may suffer "substantial" damage by reason of its enforcement. At present, the injunction may be granted if the petitioner will suffer "irreparable" damage.

5. It does not require that the amounts of the ingredients in proprietary foods and drugs be listed, and proprietary foods may be exempted from listing on the label when it would result in deception or unfair competition.

Many manufacturers disagree with these opinions, and they hope that the present provisions of the bill will be successfully defended in the House.

Patman Act Developments. Eleven chains of retail stores, dealing principally in foods, are guilty of violating the brokerage section of the Robinson-Patman Act. This is the charge brought by the Federal Trade Commission, which holds that the following chain groups and their purchasing organization, Procon Grocery Service Co., have received brokerage for services not rendered:

Kroger Grocery & Baking Co., American Stores Co., First National Stores, Inc., National Tea Co., Safeway Stores, Inc., David Pender Grocery Co., Southern Grocery Stores, Inc., Eisner Grocery Co., Steiden Stores, Inc., Danahy-Faxton Stores, Inc., and Fisher Grocery Co.

Another development in the Patman Act situation is the attack by Standard Brands, Inc., on the constitutionality of the law. This attack was based on the grounds that the law is so vague that it does not say what is lawful or unlawful, that Congress has attempted to delegate legislative power to the Administration and that Section 2 (b) is in violation of the Fifth Amendment because it places on the respondent the burden of showing justification when only a prima facie case has been made against it.

FTC recently charged Standard Brands with price discrimination in the sale of yeast, which practice the company denies.

CONVENTIONS

APRIL

7-8—Tri-State Packers' Association, spring meeting, Lord Baltimore, Hotel, Baltimore, Md.

29-May 1—American Chemical Society, Midwest regional meeting, Hotel Paxton, Omaha.

MAY

10-12—Southern Bakers' Association, Grove Park Inn, Asheville, N. C.

17-19—National Cottonseed Products Association, Baker Hotel, Dallas, Texas.

24-27—National Confectioners' Association, Palmer House, Chicago.

24-28—American Association of Cereal Chemists, Nicollet Hotel, Minneapolis.

27-29—Rice Millers' Association, New Orleans.

"Done to a Brown"

in ovens equipped with the Industrial Carburetors. Shredded Ralston, the favorite breakfast food of millions, is toasted in both traveling and rotary type ovens in the Shredded Ralston plant at Battle Creek. The Industrial Carburetor has been adopted throughout. Facts and figures show Kemp saves money for Ralston.

We will gladly make a survey of *your* situation and estimate the improvement and saving which can be effected.

Write the **C. M. Kemp Manufacturing Company, 405 East Oliver St., Baltimore, Maryland.**

KEMP of BALTIMORE

Sugar Bill Hits Snag. Prospects for speedy passage of sugar legislation urged by the President, which seemed excellent at first, clouded over after the introduction of the Administration measure by Senators O'Mahoney and Adams. The snag in the legislative path seems to be the technical difficulties over amendments to the measure made necessary by the operation, among other things, of the trade agreement with Cuba. Another stumbling block has been the fight over the quota allowance for Louisiana.

Introduction of the Administration measure cast a wet blanket on the Overton bill, and it is now felt that the measure fathered by the Louisiana senator will be forgotten. The Administration bill's sponsors are still pressing hard for imposition of a tax of 75 cents per 100 lb., but there is decided and active opposition to that. It appears certain, however, that the bill, when it finally gets past the legislative rocks, will levy a tax of 50 cents a 100 lb. This tax will be imposed on sugar made after April 1.

EXPERIENCE SHOWS THE WAY

to new economies and a better package

It pays to look beyond the boundaries of your own industry for new methods and ideas. This is especially true in packaging . . . and is one of the reasons why our wide experience in serving *many different types of package goods concerns* may prove valuable to you.

For example, we often find that new economies achieved for a concern in one industry can also be applied to concerns in other fields . . . Likewise, a style of package that has proved successful for one product can advantageously be adapted to an entirely different product. And very often the same type of machine can be employed to produce the package, thus saving the cost of designing an entirely new machine.

If you have the problem of finding a package for a new product, of securing a better selling package for an old product, or of lowering your costs, why not avail yourself of our experience? The leading package goods concerns regularly call on us for such assistance. Get in touch with our nearest office.

PACKAGE MACHINERY COMPANY
SPRINGFIELD, MASS.
New York Chicago Cleveland Los Angeles
Mexico, D. F., Apartado 2303
Melbourne, Australia: Baker Perkins, Pty., Ltd.
Peterborough, England: Baker Perkins, Ltd.

PACKAGE MACHINERY COMPANY
Over a Quarter Billion Packages per day are wrapped on our Machines

Mid-March

CAPITAL VIEWS

UNIONIZATION—Thus far, there is little evidence in Washington that the food industries have been placed very high up on the priority list for attention by C.I.O. Nevertheless, some plants are bound to undergo organization effort soon, including flour and cereal mills being worked already by A. F. of L.

» FOOD LAW — President Roosevelt would dislike very much to have Senator Copeland get the credit for enactment of a vigorous modern food and drug law. This fact probably was more the cause of the President's criticism of the Copeland bill as it was before the Senate in late February than any technical objections presented.

The three principal objections from the more ardent advocates of enforcement, both within and without the Food & Drug Administration, are: (*a*) The limitation on multiple seizures, which merely makes mandatory a practice voluntarily followed by the Department in the past; (*b*) the provision that suits may be tried at a point convenient to the goods owner, not in the jurisdiction chosen by officials because, it is charged, a favorable attitude of the court is believed to exist; (c) the addition of the word "material" in the phrase, "misleading in any material particular," which would make binding on the court what has probably been general practice, but which might be taken by some courts to mean that Congress intended to weaken the law.

» SUGAR TAX—Forecasters expect that Secretary Wallace will be granted a tax on sugar, but not the cent a pound which he first asked. The President early in March recommended three-quarters of a cent, which appeared to violate the Cuban trade agreement. But skilled news sleuths believe they have discovered a gap in that treaty which would permit that tax.

No one in Washington really believes, probably not even the President, that such tax will not raise the price

of sugar. Incidentally, domestic producers of sugar think even less than a half-cent tax would suffice, and they fear that any sugar-price increases would curtail consumption.

» CAN SIZES—The Bureau of Standards during early March distributed the proposed new schedule of standard can sizes under the simplified practice program, in which the industry has cooperated. Seven thousand users of cans for fruits and vegetables are being asked to lend support to the program. It is understood, however, that "specials," in addition to the 21 recommended sizes, will be permitted. They would, however, constitute a very small percentage of the total business, the simplifiers hope.

» CROP INSURANCE — A comprehensive program to insure wheat farmers against crop failure will shortly be enacted by Congress, according to the best forecasters of Washington. These same experts do not think that the ever-normal-granary bill is likely to be enacted. Nor do they expect the insurance to be extended beyond wheat, though producers of some other commodities may clamor loud enough to get recognition. The main argument, which would please food processors if it proves true, is that this insurance will stabilize prices below past averages.

» MANAGED AGRICULTURE—Recent official statements by the Secretary of Agriculture, not officially publicized but still accurately reported, demonstrate that nothing short of complete control of agriculture production and merchandising will serve the present philosophy of Secretary Wallace. Any food industry dependent on agricultural raw materials must contemplate that by some means or other Uncle Sam is going to become almost a direct manager of farm enterprises. Quite as complete and detailed control will eventuate as was undertaken, with some success, during the heydey of the AAA.

CONCENTRATES

• Additional time for filing "windfall" tax returns is granted by a resolution which passed Congress in March. The deadline, formerly March 15, was extended to June 15.

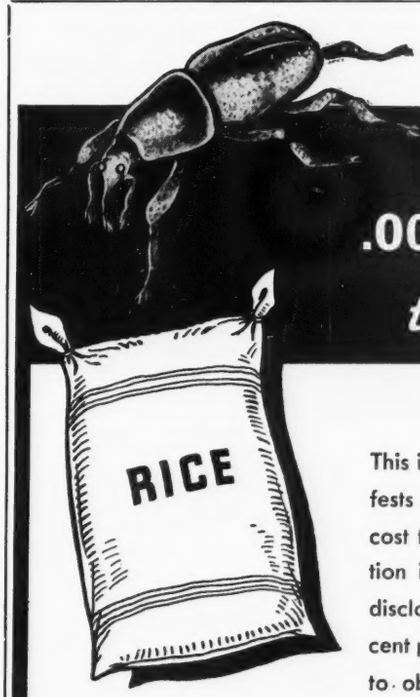
• *Four suits for refunds of some $14,000,000 in processing taxes have been dismissed by a Federal court in Chicago on the ground that Congress, through certain sections of the revenue Act of 1936, has withdrawn the consent of the United States to be sued. Cudahy Packing Co.. Morton Salt Co. and two other concerns brought the suits.*

• New York State's resale-price-maintenance has been ruled constitutional, and similar legislation prohibiting price cutting on trade-marked products has been introduced in the Connecticut legislature.

• *Rice production will be stabilized again this year by benefit payments to farmers under the Soil Conservation Act, these payments being at the rate of 20 cents for each 100 lb. of the farmer's quota if the acreage planted is between 85 and 100 per cent of the base acreage.*

• Two years of research on a commercial-plant scale and one year of commercial production in a trial plant at Laurel, Miss., indicate that sweet potato starch production gives promise as another Southern farm industry.

• *With the aid of chemical nutrients, a Turkish tobacco stalk 6 ft. tall has been grown at Columbia University, where experiments also are being conducted in the chemical culture of beans, corn and tomatoes. The nutrient included copper sulphate, boric acid, manganese and zinc sulphates, nitrate, magnesium sulphate, potassium, acid phosphate and calcium nitrate.*



Would you pay .001 CENT PER POUND to kill this bug?

This is the Rice or Black Weevil which infests rice. These pests and their progeny cost the rice producers *plenty*. Investigation in one rice plant by our engineers disclosed the fact that it would cost .001 cent per pound for sufficient LIQUID HCN to obtain a *complete kill* in their bulk rice and .002 cent per pound in their packaged rice.

You may produce, or use, such products, as rice, flour, raisins, dates, figs, nuts, cocoanut and other foods which are subject to insect infestation. If so, write us for an estimate of the cost of obtaining a complete kill on the particular product you handle.

LIQUID HCN is an all-purpose pest destroyer. It is a powerful, concentrated, economical and efficient fumigant. Completely controls all insects which infest stored products, and kills rats and mice.

The American Cyanamid Company is the only manufacturer of HCN in all its modern forms — LIQUID HCN, ZYKLON DISCOIDS and CYANOGAS.

AMERICAN CYANAMID & CHEMICAL CORPORATION
Insecticide Department
30 ROCKEFELLER PLAZA, NEW YORK, N. Y.
KANSAS CITY MO. AZUSA, CALIF.

MEN, JOBS *and* COMPANIES

Industry

» ARMOUR & Co., Chicago, plans to retire its entire present outstanding funded debt. Call has been issued for the redemption on June 1 of $27,813,000 of real estate first-mortgage bonds due June 1, 1939. Armour recently purchased a site for a $150,000 plant at Charlotte, N. C.

» BEATRICE CREAMERY Co., Chicago, has absorbed three subsidiary companies: Hutchinson-Meadow Gold Co., Centrox Dairy, Inc., and Weber Ice Cream Co.

» BERCUT-RICHARDS PACKING Co., will construct a new cannery and warehouse at Sacramento, Calif. The cost will be $160,000.

» BOWMAN DAIRY Co. has sold its Marathon plant to White House Milk Co., Wausau, Wis.

» CALIFORNIA CRACKER Co. will spend about $500,000 to convert a two-story building in Los Angeles into a modern bakery.

» CALIFORNIA PACKING CORP. will double the size of its plant at Sacramento at a cost of about $135,000.

» CHILTON (WIS.) BREWERY has been purchased by Henry C. Rahr, Green Bay.

» HAROLD H. CLAPP, INC., will move its plant and headquarters from Rochester to Trumansburg, N. Y

» COCA-COLA BOTTLING Co. will erect at Buffalo a new storage building costing $50,000.

» CUDAHY PACKING Co. recently opened a new egg-breaking plant at Cuero, Texas. The plant has a capacity of 1,000 cases of eggs daily.

» DUNCAN COFFEE Co. has purchased Magnolia Coffee Co., Houston, Texas.

» GENERAL BAKING Co., New York. will open a bakery at Pittsfield, Mass.

» HOUSTON (TEXAS) MILLING Co. is spending $220,000 on the construction of a feed mill, warehouse, elevator and office building.

LIPPINCOTT Co., Cincinnati, will put up a $125,000 canning factory at Napoleon, Ohio.

WILLIAM F. REDFIELD

He has been named vice-president and elected a director of Hills Bros. Co., New York. Formerly general sales manager, Mr. Redfield has been with the company for sixteen years. From 1925 to 1927, he was managing director of Dromedary, Ltd., London.

RALPH L. LUDDECKE

Traffic manager of Standard Brands, Inc., New York, and in the employ of the company for 30 years, he has been made vice-president of Fleischmann Transportation Co., a unit of Standard Brands. He succeeds the late Hugh M. Freer.

» MINNESOTA VALLEY CANNING Co., Le Sueur, has won a suit against Owen (Wis.) Canning Co. over the use of the trademark, "Green King," by the latter. The trademark was held to be confusingly similar to the "Green Giant" trademark of the Minnesota Valley company.

» PET MILK Co. recently enlarged Greensboro (N. C.) Creamery Dairy at a cost of $100,000. The company has acquired the Philadelphia, Miss., plant of Beech Cheese Co.

» PHILLIPS PACKING Co., Cambridge, Md., increased its assets by more than $1,000,000 (from $5,459,899 to $6,574,762) during the year ending Dec. 31. The company at the same time added a half million dollars to its surplus, bringing it to $2,795,508.

» A. F. SCHWAHN & SONS Co.. Eau Claire, Wis., is constructing a modern sausage plant at a cost of about $115,000.

» STANDARD BRANDS, INC., New York, recently requested from stockholders the authority to absorb Royal Baking Powder Corp. in which it owns more than 99.5 per cent of the common and 98.5 per cent of the preferred stock.

» VAN DE KAMP'S HOLLAND DUTCH BAKERS, INC., soon will launch a $75,000 expansion program in Seattle. The company's sales for 1936 were 16 per cent above those for 1935.

Personnel

» A. H. BREWER has been made superintendent of the La Porte, Ind., plant of Iowa Canning Co.

» CLINTON L. BROOKE is making an economic study of the manufacture of malted wheat flour for Quaker Oats Co.

» E. E. CHASE again has been reelected president of Canners' League of California. He is with Richmond-Chase Co., San Jose.

» JOHN B. COLLIER, Fort Worth, has been reelected president of Texas Butter, Egg & Poultry Association.

» ELROY W. DAVIS, Federal Mills, Inc., Lockport, N. Y., is the new chairman of the local district of Association of Operative Millers.

» WILLIAM DUFF, II, P. Duff & Sons, Pittsburgh, heads up Peanut Butter Institute for the coming year.

» M. A. ERICSON, traffic manager for Shotwell Manufacturing Co.. Chicago, recently was elected chairman of the executive committee of Confectioners' Traffic Association. A. E. Huener-

yager, traffic manager for Zion Industries, Inc., Zion, Ill., was elected secretary-treasurer.

» W. H. FLOWERS, Flowers Baking Co., Thomasville, is the new president of Georgia Bakers' Association.

» G. W. FRIER heads up Arkansas Association of Ice Cream Manufacturers. He is district manager of Southern Creameries of Texarkana.

» FRANK GERBER has been elected president of Fremont (Mich.) Canning Co. Other officers named at the same time include Dan Gerber, first vice-president and assistant manager; Cornelius Gerber, second vice-president; Clarence Gerber, assistant treasurer.

» L. S. GLASER, Glaser-Crandell Co., Chicago, is the new president of Pickle Manufacturers' Association.

» FLETCHER GOODRICH succeeds L. J. Dillon as manager of the Hudson, Ind., plant of Pet Milk Co.

» DR. R. W. HAMAN has taken a position as chief chemist in charge of production control with Wander Co.. Villa Park, Ill.

» EDWARD F. HUTTON, former chairman of General Foods Corp., New York, has resigned as a director of the company. Udell C. Young, vice-president in charge of manufacturing and traffic, succeeds him.

» L. C. KAUFMAN has become president of Pacific Packing Co., Oakdale, Calif., succeeding H. T. Lange.

» GEORGE KELLEY has gone with Food Products Co., Athens, Texas, as manager. He resigned as manager of Toledo (Ia.) Cooperative Canning Co.

» FRANK P. LACEY, Palestine Creamery, has been elected head of Texas Association of Ice Cream Manufacturers.

» HAROLD F. MAGEE and JAMES R. STUART have organized Somerset Packing Corp., Somerset County. Pa. Mr. Magee formerly was sales manager of Mushroom Cooperative Canning Co., Kennett Square, Pa. Mr. Stuart was promotion manager of B. F. Shriver Co., Westminster, Md.

» NORMAN H. MAYOR has become president of New England Association of Ice Cream Manufacturers.

» PAUL MOZINGO has left Kroger Grocery & Baking Co., Cincinnati, to take a position with Stokely Bros. & Co., Indianapolis, as assistant to C. C. Culp, vice-president in charge of sales.

» JOSEPH D. NOONAN, former manager of the Omar Bakery at Indianapolis, recently became vice-president and general manager for Scotland Bakeries, Inc., Orange, N. J., and Scotland Bakeries of New York, Inc., Mt. Vernon.

» TED ROBINSON has been reelected president of Texas Milk Dealers' Association. He is from Dallas.

» G. A. TRICE, executive vice-president of Jersey Ice Cream Co., Miami, since 1926, has been promoted to president and general manager of the company.

» VERN C. VANDERBILT is now president of Indiana Bakers' Association.

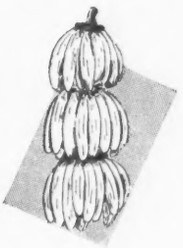
» KING WEEMAN has been made president of Shawano (Wis.) Canning Co.

Deaths

» WILLIAM A. BELLINGRATH, 69, founder of a soft-drink bottling business which expanded to one of the largest in the South, at Montgomery, Ala., March 11.

» PATRICK BURNS, 81, last of the Cana-

If we could make a Truck for Bananas



WE CAN MAKE ONE FOR YOU

That money-saving, floor-skimming Service Truck which we will suggest to suit your particular problem, may not even be built yet.

Yes, we had no banana trucks when a big food warehousing concern asked us how to handle the fruit by the carload or shipload both *faster* and *without bruising*. But the illustration below shows one of the units we developed to handle 13 bunches *without contact*—but with the swiftness and stamina characteristic of all Service units.

What we have to offer (*in return for a letter from you about an equivalent situation in your work*) is this: The engineering experience which created the widely used line of standard Service Casters and Trucks—ready at your request to make a special application for you. What may we suggest?

SERVICE CASTER & TRUCK COMPANY
525 Brownswood Ave., Albion, Mich.

Service CASTERS & TRUCKS

dian West's great cattle kings and founder of the $15,000,000 P. Burns & Co., Ltd., packing plant, at Calgary, Alberta, Feb. 24.

» PAUL FITZSIMMONS, 61, founder of Pritchard Rice Milling Co. and Eagle Lake Rice Milling Co., at Houston, Texas, recently. Mr. Fitzsimmons was a past president of Rice Millers' Association of America.

» HENRY FRANK, 58, president of H. Frank & Sons, meat packers, at Elizabeth, N. J., Feb. 28.

» JOHN L. LIGGETT, 67, one of the organizers of General Baking Co. in the Midwest, at Miami, Feb. 15. He retired in 1927.

» WILLIAM P. B. LOCKWOOD, secretary of New England Association of Ice Cream Manufacturers and former manager and director of New England Dairy and Food Council, at West Newton, Mass., recently.

» GEORGE F. PESSONEY, 59, president of Pessoney Candy Co., Palestine, Texas, recently.

» CHARLES RUELKE, 70, treasurer of People's Brewing Co., Oshkosh, Wis., Feb. 24.

» FRANK G. SHATTUCK, 76, founder of Frank G. Shattuck Co., New York, operator of Schrafft stores, March 13.

» AUGUST SCHMIDT, 60, president of Schmidt Provision Co., Toledo, Feb. 18.

» HARRY J. TATE, 69, chairman of Jersey Ice Cream Co., Miami. Feb. 20.

» HERBERT E. WRIGHT, 64, president of H. E. Wright Co., Charlestown, Mass., March 1.

Associated Industries

» AMERICAN ROLLING MILL CO. has established a district sales office at Indianapolis. Austin Edwards has been named manager.

» AUDUBON WIRE CLOTH CORP. has appointed W. S. Yates Associates to handle all of its products in the Chicago district.

» CREAMERY PACKAGE MANUFACTURING CO. announces the appointment of E. B. Lehrack as vice-president. Mr. Lehrack is a former Creamery Package salesman and founder of Lehrack-Ferguson Ice Cream Co., Wichita Falls, Texas. Creamery Package also has appointed O. A. Olson special sales representative in the New York City branch.

» FOOTE BROS. GEAR & MACHINE CORP. has named E. G. Akridge direct factory representative in the Detroit territory.

» FOSTER WHEELER CORP., New York, announces the appointment of Howard B. Hall as regional director in charge of its Cleveland, Cincinnati and Pittsburgh territories.

» GIFFORD-WOOD CO., Hudson, N. Y., has purchased the Creasey Ice Breaker department of Cochrane Corp., Philadelphia.

» LUDLUM STEEL CO., Watervliet, N. Y., has appointed W. L. Weaver as manager of stainless castings sales.

» NATIONAL ADHESIVES CORP. is constructing a new factory and offices at Chicago.

» ROLLER-SMITH CO. has appointed Paul Berry agent for Oklahoma, the Panhandle of Texas and the northern part of Arkansas.

» WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has elected C. W. Pomeroy secretary to succeed the late Warren H. Jones.

WHY LO-BAX IS A DEPENDABLE STERILIZER

FOR sterilizing surfaces with which dairy and other food products come in contact, you require a dependable, quick-acting bactericide. Your bactericide must also, of course, be safe, convenient and low in cost.

How does Lo-Bax meet *all* these vital requirements?

In the first place, extremely low alkalinity and high chlorine "availability" make Lo-Bax unique among sterilizers for speed and dependability in killing bacteria. The quick solubility of Lo-Bax, moreover, renders positive results doubly sure. For at the end of only one minute, Lo-Bax solutions are up to full strength and ready for use. There are no undissolved, concentrated particles to cause corrosion.

Lo-Bax is easy to use—just add it to water by the spoonful as needed. Lo-Bax is low in cost—one bottle (1¾ lbs.) makes more than 1,000 gallons of clear, 100-p.p.m. bactericidal rinse solution.

Why not let Lo-Bax help you maintain low bacteria counts? Write for full information today.

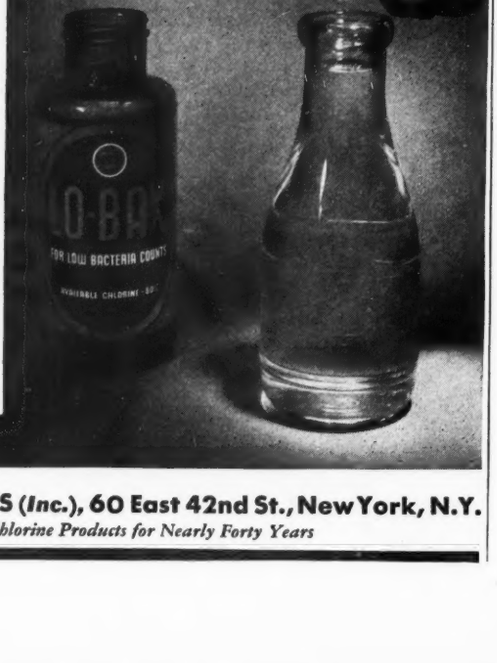
Make This Test—Prove to yourself that Lo-Bax dissolves faster

Fill a milk bottle up to an inch from the top with ordinary tap water. Pick up a small amount of Lo-Bax on a knife blade and drop it slowly onto the water.

Now notice how the fine Lo-Bax powder floats for a moment on the surface and then gradually settles through the water, dissolving as it goes. Watch the particles break up and completely dissolve as they slowly descend, see them disappear even before they reach the bottom. Test the chlorine in the resulting solution and prove to yourself that Lo-Bax makes full strength solutions in less than one minute.

After you've watched Lo-Bax go into solution, make this same test with a similar product. Watch the coarser particles nose-dive for the bottom, remain there undissolved, inert. Time how long it takes you to break up these particles and stir them into solution.

Then consider what the full strength solutions quickly secured with Lo-Bax mean to you in added convenience and more positive results--what this superior solubility means in safety from corrosion!



The MATHIESON ALKALI WORKS (*Inc.*), 60 East 42nd St., New York, N.Y.

Pioneer Manufacturers of Chlorine Products for Nearly Forty Years

Price or Quality

(*Continued from page* 181)

The housewife buys for the party in a party mood. The pursestrings are open to variety and quality; expense is no longer curbed. Mrs. Jones may still depend on the neighborhood chain for many of her pantry staples, but more and more she selects her party menu from the service store.

Housewives Pay for the Quality Touch

Curtice Brothers Co. which for years considered a vegetable pack in glass, waited until 1936 to test the quality market. This test was made only after field studies indicated that a growing quality market was under way. This glass pack, although small, was in addition to the regular tin pack. The glass packed vegetables were identical with those packed in tin—the quality of both packs was the same—the difference was entirely in the container. Even though these same vegetables cost more, in glass, they look well worth the difference to the consumer. The trade was not advised of Curtice's line of Blue Label vegetables packed in glass, nor were the company's salesmen, until after the middle of January, this year. Although the size of orders accepted was limited in order to get widespread distribution, the entire pack moved to the trade in just a month after the first offering. It is interesting that the 16-oz. package in glass was priced to sell at retail for 3 cents above the regular tin pack of 20 oz. Less and less does the housewife weigh her purchase against the price. More and more she succumbs to the impulse to have those things with the quality touch.

Mayonnaise or Salad Dressing

One of the best indications of the trend toward a quality market is the preference of consumers for the more expensive brands of the same company. As the full force of the depression was felt, the sale of mayonnaise declined and the sale of salad dressing increased. This was generally true of the sales of all companies manufacturing both products. In the case of the Ivanhoe Foods, Inc., Auburn, N. Y., salad dressing sales ran away with mayonnaise sales to the extent of five to one up until almost the first of 1937. The change has come within the past six months. Now mayonnaise sales have forged ahead of salad dressing sales.

There is a sharp price differential between the two which during the depression focused buying economy on the cheaper, the salad dressing. This present swing to mayonnaise is a reliable index of buying trends away from price to quality.

During the depression the prepared meal outlets for food experienced a series of decided changes. Coffee shops and cafeterias replaced hotel dining rooms and restaurants. Many restaurants turned into lunchrooms. An entirely new crop of roadside stands sprang up to accommodate the transients who traveled by bus and automobile, and with them the "thumber." By the end of 1933, the number of eating places had increased from 134,293 to 200,335, a 49.3 per cent increase above 1929. However, the total food sales of all of these outlets had decreased 32.7 per cent below the sales of 1929 from $2,124,890,000 to $1,429,938,000. Now the pendulum swings the other way. Many bus riders are riding by rail, especially since the railroad fare reductions. The "thumbers" are thinning out. Since the revival of business, new salesmen are out on the road; some use their own or company cars, many travel by rail and not a few have taken to the air. Business in foreign fields is calling American executives across the water.

Business alone does not account for the present increase in transients. Depression's stay-at-homes are on the move. Railroads, steamship and air lines are reporting a large percentage of increase in both the number of passengers and passenger-miles, an increase not to be accounted for entirely by the commercial travelers. This increased travel is responsible for an even greater increase in the number of meals served enroute and also in the dollar value of these meals. Hotels too, have benefited greatly by this flow of transients, particularly in the restaurant end of the business, where the percentage increase in revenue from meals is greater than the increases from other sources.

Sixteen and one-half per cent of the 1929 retail sale of foods was made by restaurants and eating places, 83.5 per cent by regular food outlets. This is exclusive of the sale of prepared meals by hotels, railroad diners and steamships. Not all the estimated two billion dollar receipts from prepared meals in 1937 will originate from the quality food market. No, for the lunchroom, dining wagon and hot dog stands are still with us. It is encouraging, however, that those eating places where meals are prepared from quality foods are registering the increases in patronage and dollar volume.

Major Outlets for Quality Foods

Hotel kitchens are among the largest consumers of quality foods. During 1936 hotel meals throughout the country increased in dollar value about 20 per cent. New York City hotels welcomed an increase of 28 per cent. The revenue from hotel meals for 1937 is estimated at better than $350,000,000—a large market for the manufacturers of quality foods.

Railroad passenger-miles increased 23.8 per cent during 1936. This increase stepped dining car meals up an even greater percentage. The 1936 revenue of 25 million dollars from meals served on diners will probably reach close to 30 million dollars in 1937. While the dollar volume of dining car meals is considerably less than the dollar volume of hotel meals, nevertheless a much larger percentage of dining car meals are prepared from quality foods.

Steamship companies must tempt distressed as well as salt air stimulated appetites. Their menus contain a variety of fancy and expensive food luxuries to meet the gastronomic demands. They cater to pampered tastes. Steamship passenger travel increased better than 18 per cent during 1936. The dollar revenue from steamship meals increased an even greater percentage. Steamship food requirements fall largely in the quality group.

Although the food requirements of the airliners have largely been within the confines of the quality food market, airliner meals have only recently passed out of the lunch-box stage. An increasing proportion of transport meals are now prepared in the air. Airplane companies collected last year $470,000 for meals served to their passengers. A small market to be sure, but definitely a quality market and one that is growing.

In the United States the volume or tonnage of food consumed varies little in times of prosperity or financial distress. It is the dollar volume that expands and contracts with economic changes. As business improves, dollar volume is increased through general price advance and also through "trading-up." Unquestionably, 1937 will show a shrinkage in the volume of price merchandise and a corresponding demand for quality merchandise.

Cooling Chocolate Coating

(*Continued from page* 189)

the use of a turntable placed at the end of a cooling tunnel which turns the goods around without disturbing their arrangement and sends them back through a second tunnel or over a packing table parallel with the first cooling tunnel. In this connection it might be well to remember that these turntables are made to turn the direction of movement of the goods through either 180 deg. or 90 deg. or, in fact, through any number of degrees that will best suit the user's convenience. Choice depends on whether or not it is convenient to have the packing table parallel with the cooling tunnel or at an angle.

The second solution to the problem of limited floor space is what is known as the automatic or traveling-tray type cooler which makes use of steel trays moving in multiple laps through a vertical plane. These trays are successively and automatically shifted into position at the delivery end of the enrober wire belt. Glazed paper sheets are moved onto the steel trays in such a way that the coated confections will pass onto the trays from the wire mesh conveyor of the enrober in the same manner as they would go into a tunnel. The loaded tray then moves automatically into the cooling section of the system. A new tray shifts into position at the enrober in the meantime. The trays to be cooled travel upward in a tower and pass through one or more towers according to the cooling time required. At the end of the cooling time the trays are returned to the packing level.

This type of cooling equipment gives the longest possible cooling time in the shortest space. As much as 30 minutes or more cooling time is had at a belt speed of 10 ft. per minute and a packing space of 32 ft. may be had in a floor space length of about 50 ft. This set-up is an ideal arrangement for combining long-time cooling with a machine production rate of high-grade work.

Care must be taken to see that the humidity in the room into which the cooling tunnel or automatic cooler discharges is sufficiently low to prevent condensation on the cooled confections. If moisture should condense on the surface of the coated confections, a splotched appearance will result. These splotches are called "sugar bloom" and are the result of moisture having dissolved sugar out of the coating and, upon evaporation, leaving behind groups of small sugar crystals.

The streaks and grey or moldy appearance of the coated confections indicate that the chocolate was used at a too high coating temperature or that the cooling tunnel was operated at too high temperature for the speed of the conveyor belt carrying the confections or that centers were too cold when chocolate was applied.

These conditions are avoided when the chocolate coating at near setting or freezing temperatures is applied to the centers of right temperatures, is given a slight vibration to cause separation of very thin film of fat, and is passed through a dry refrigerated cooling area at a rate of movement which will give the confection sufficient time to be well-cooled throughout and the chocolate to be completely frozen.

Safeguard and Protect your Product from Contamination or Spoilage by Cleaning and Sterilizing Equipment and Utensils with Dependable Oakite Materials

You cannot be too careful about cleaning and sterilizing equipment and food handling surfaces. Product quality, flavor or even spoilage depends on the efficiency and thoroughness with which these daily and important operations are performed.

That is why we say . . . don't risk contamination of product . . . but clean equipment FIRST with dependable Oakite materials . . . then KILL BACTERIA by sterilizing with Oakite Bactericide. Modern Oakite cleaning and sterilizing materials help you consistently maintain high sanitary standards. In addition, they provide the advantages of economy, speed in cleaning and safety to equipment. May we send you FREE booklets with further interesting detail? No obligation . . . write today.

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—SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

Controlled Atmosphere in the Margarine Plant

(*Continued from p.* 189)

siderable free fatty acid, which then gives rise to a disagreeable soapy flavor. Coconut-oil fatty acids have a particularly disagreeable taste, even in low concentrations, and it is probably for this reason that coconut-oil margarins are said to be especially susceptible to the action of air-borne organisms.

No matter how careful, even meticulous, a margarin manufacturer may be in regard to the conditions of sanitation in his plant, the flavor quality of his product is, so to speak, "in the laps of the gods" if he has no control over the air-borne organisms in his plant. It is not possible to completely hinder the action of these organisms by increasing the salt content of the product or by means of a preservative, although these steps are of help.

Usually, the lower floors of a plant show the highest counts, or numbers, of micro-organisms because they are nearest the ground. Soil is the source of many organisms, but, naturally wind conditions frequently increase or decrease the number in the air. Also, there is often an increase in air-borne organisms immediately after an intensive clean-up campaign —just the opposite of what is usually expected.

To check up on the presence of air-borne organisms is easy. Simply expose open sterile petri-dish culture media at various points throughout the plant. The dishes are then closed and incubated for a week.

The same method may also be used to check up on the sterility of the air being supplied from a duct outlet. Exposure of a sterile culture-medium plate for five minutes at such an outlet should show no organisms present after incubating five to seven days at 68 deg. F. (20 deg. C.).

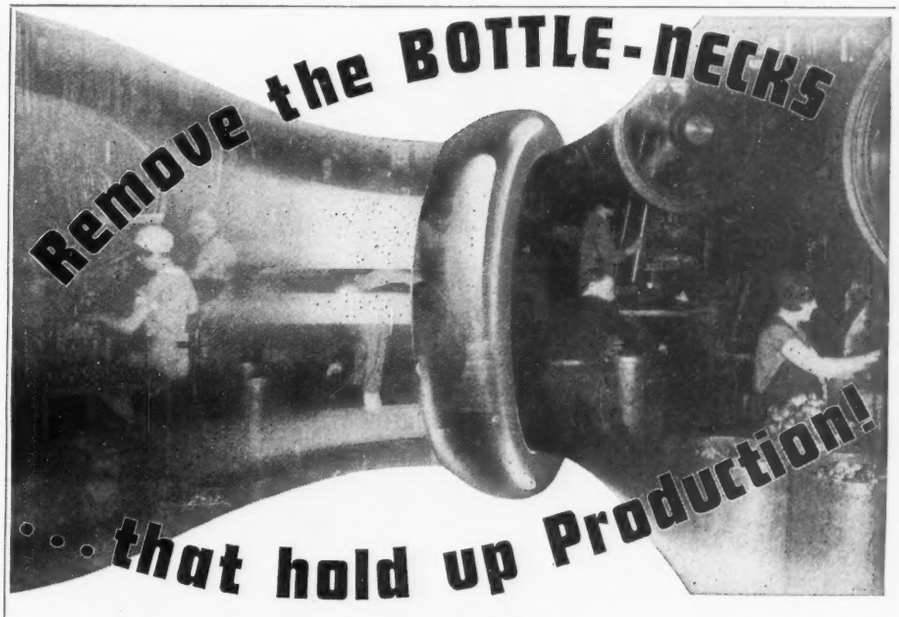
Temperature and humidity control in the margarin plant is useful particularly where the plant is so located that it is subjected to many hot and humid operating days during the year. Most margarin-plant operators will agree that the product is difficult to handle and package under high humidity conditions because of its tendency to be sticky and soft. Of course, a good partial remedy for this lies in controlling the physical constants of the margarin oil being converted into margarin which is just another way of saying that such temperature and humidity control are conveniences but not essentials.

It is not always easy to "sell" the desirability of air filtration in a margarin plant to the owners. This is because the advantage to be gained is largely in the realm of intangibles. Usually, it is difficult to prove definitely that the flavor of a margarin is not just right because of the action on it of air-borne organisms, or that the returns of "moldy" butter are due to the contamination by air-borne molds *during manufacture* rather than later. However, in summarizing, it can be definitely said that:

(*a*)—The presence of air-borne molds in the plant and their harmful effect can be demonstrated readily.

(*b*)—The efficacy of a good air-filtration system can be proven easily.

(*c*)—It is, therefore, obviously good practice to filter the air supply as an aid in maintaining good flavor quality and minimizing returns.



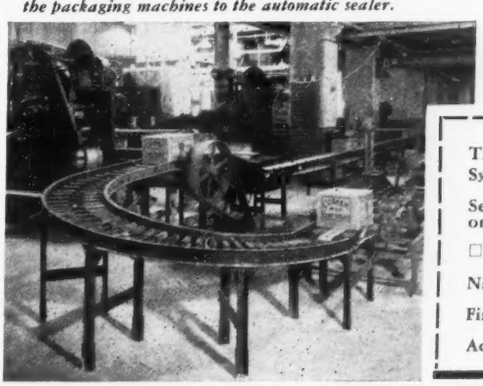
NO system of production operations is faster than its slowest link . . . the congested points, the "bottlenecks" that slow up the steady flow of materials in process.

Food plants are alert to the importance of conveyors, yet practically every plant has some stagnant point, frequently two or more—no matter how efficient the general layout may be. Many times these "bottlenecks" can be completely removed by the correct use of Lamson Conveyors. Sometimes a simple rearrangement of the present conveyor system, or a single new conveyor, is all that is needed.

Fifty years of experience in dealing with similar problems enables our engineers to recommend effective ways for removing the "bottlenecks" in your plant—specialized knowledge that's yours for the asking.

Ask for an engineer to call. Or mail the coupon and learn all about the latest types of Lamson Conveyors for solving all handling problems.

Lamson Conveyors in a well-known Sugar Plant. Photograph shows cartons being automatically conveyed from the packaging machines to the automatic sealer.



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Therapeutic Uses for Vitamins

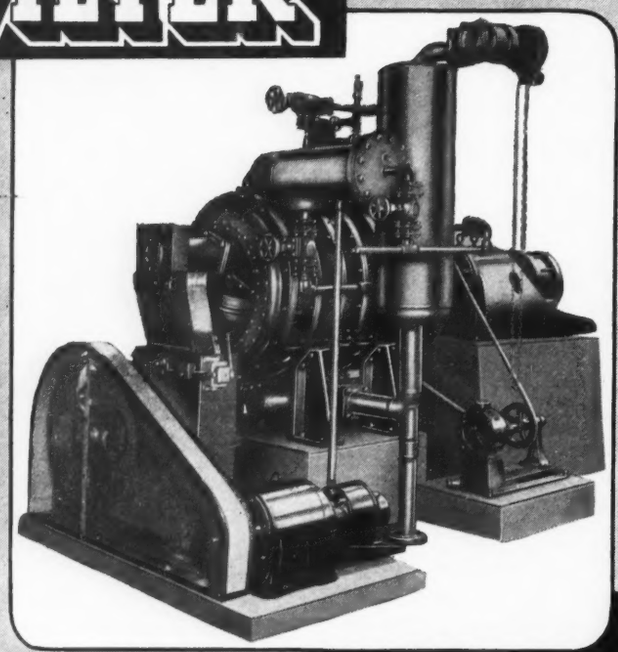
VITAMINS have long since won a place in human nutrition for three major purposes: preventing or curing the "deficiency diseases"; promoting growth; and increasing or maintaining reproductive vitality. From recent research it appears, however, that vitamins are capable of rendering important service in a field which extends far beyond the boundaries of the uses just enumerated. The preliminary trials which revealed this possibility were made chiefly with ascorbic acid (vitamin C). This, the vitamin which prevents or cures scurvy, was given to human patients in doses as great as sixteen times the quantity needed to prevent scurvy, and was found to be harmless in such doses. It was then used medicinally in a number of ways.

Experiments showed that Vitamin C, in addition to its three nutritional functions, has also at least three therapeutic functions. *First,* it stimulates formation of blood and has other beneficial effects in the blood stream and so is helpful in anemia and hemophilia. *Second,* it promotes hormone activity and so is an excellent aid in the medical uses of hormones, especially cortin (the suprarenal gland hormone). *Third,* it diminishes or counteracts the dangerous effects of certain toxins and poisons, among them salvarsan and diphtheria toxin.

Vitamin A also has medicinal effects, one of the most important being that it counteracts the poisonous effects of thyroxin, so that diseases of the thyroid gland can be treated more safely with its aid. Results in this field are not yet fully conclusive, but show much of promise for vitamins A, B, B_1, C and D in addition to their present uses in the diet.

Digest fom "New Viewpoints in the Clinical Uses of Pure Vitamins," by W. Stepp, *Angewandte Chemie,* 50, 30-34, 1937. (Published in Germany.)

VILTER



PAKICE DOES IT BETTER

Whatever your requirements for product icing or product cooling, PakIce will not only do it better but a great deal more economically. With a Vilter PakIce Machine you can make ice as you need it and when you need it; you can make it in the form best adapted to your needs — either briquette or crystal form. PakIce is automatic; requires little space; needs no special attendant. Costs little to install and pays for itself in a short time.

Write for complete bulletin of facts.

THE VILTER MANUFACTURING COMPANY
2115 South First St.
MILWAUKEE, WISCONSIN
Representatives in Principal Cities

Food Conservation Under the Nazis

GERMANY'S systematic "Campaign Against Spoilage" centers around ten commandments of conservation which go hand in hand with the other side of the national undertaking, namely increase in domestic production of foodstuffs. Industry will be encouraged to improve storage and preservation practices for fruits, vegetables, meats, dairy products and the like. Economy of heat energy will be emphasized as a major objective in the application of this refrigeration.

In the homes, proper conditions for kitchen and cellar storage will be taught so that housewives may contribute their share in the campaign. There will also be active efforts, both industrially and in the homes, to protect foodstuffs of all kinds from loss and spoilage by the attacks of pests, whether microorganisms, insects or rodents. Modern devices such as fruit grading machines, seed fumigants, seed cleaning machines and other products or machines will call forth active cooperation of engineer and chemist to make the campaign both efficient and effective.

Utilization of waste food products will receive attention, both on an industrial scale and as a matter of household economy. And finally, but not least important, science will be asked to keep the forces of law always at least one step ahead of the ingenious tricks of the food adulterator. Preserving liquid egg yolk with hydrofluoric acid, staining questionable or dangerous mushrooms to imitate truffles, selling dyed milk powder as dried eggs and other fraudulent practices will not be allowed to pass unchallenged through lack of scientific supervision. Thus will the food supply of a nation be conserved.

Digest from "Campaign Against Spoilage," *Chemiker-Zeitung,* 60, 926-7, 1936. (Published in Germany.)

BOOKS RECEIVED

YEAST FERMENTATION AND PURE CULTURE SYSTEMS. By Stephen Laufer and Robert Schwarz. Published by Schwarz Laboratories, Inc., 202 East 44th St., New York N. Y., 1936. 112 pp., 6¼x9¼ in., cloth; illustrated. Price $2.50.

Presented as a manual for the practical brewer this monograph emphasizes the importance of pure yeast culture and its relation to brewery fermentation and to the production of good beer.

Under identifying division headings brewers' yeast, fermentation practice, and pure yeast culture are discussed in a manner which the brewer can interpret in terms of his brewery operations and use as a guide. Much of the contents of this book is presented in lectures given by the authors at the United States Brewers' Academy on the technology and biology of brewing and in a series of articles on yeast and fermentation published in *The American Brewer.*

LACTOBACILLUS ACIDOPHILUS AND ITS THERAPEUTIC APPLICATION. By Leo F. Rettger, Maurice N. Levy, Louis Weinstein, and James E. Weiss. Published by Yale University Press, New Haven, Conn. 1935. 203 pp. 5½x8¼ in., Cloth. Price, $2.50.

Famed for its researches on intestinal bacteria over the past twenty years, Yale laboratory of bacteriology has concerned itself in a large way with the influence exerted by lactose, dextrin and milk on the bacteria that are found in the intestinal tract of man and the lower animals.

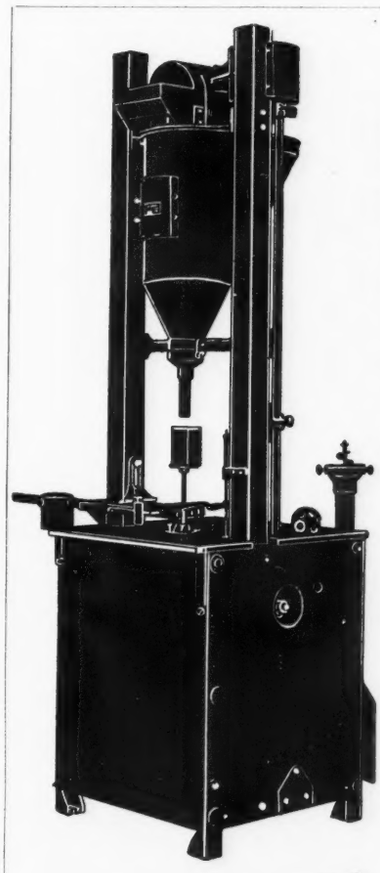
This treatise is a compilation of reports on studies made by the authors over a period of four years in correlating results of researches on lactose, dextrin and milk in the treatment of intestinal disorders. The results of these studies are primarily of interest to producers of cultured milks, of foods for infants and convalescents, and of similar dietary foods, and to the medical profession.

GROUP SELLING BY 100,000 RETAILERS. By Gordon C. Corbaley. Published by American Institute of Food Distribution, Inc., 420 Lexington Ave., New York, N. Y., 1936. 190 pp., 6x9 in.; cloth. Price $3.75.

As a food industries study, based on the research findings of Donald E. West and Ruth B. Delclisur, this treatise traces the evolution of the voluntary chain store group, now responsible for from 25 to 30 per cent of all food sales in the United States. The findings, tabulated results of questionnaires to more than 15 per cent of the 800 voluntary chains, constitute a comprehensive guide to the voluntary chain store method of doing business. It shows the prevailing methods of handling such problems as credit, premiums, private labels, dividends to members and merchandising of perishables. Its chief value to the food manufacturer is the information made available to any organization having or anticipating business relations with the voluntary chains. This information contrasts the methods of the independent, super-market and corporate chains.

TIN PLATE AND TIN CANS IN THE UNITED STATES. Published by the International Tin Research and Development Council, 149 Broadway, New York, N. Y., 1936, 144 pp., 8¼x10⅝ in.; paper; illustrated. Free.

Prepared by the Battelle Memorial Institute, Columbus, Ohio, this Bulle-



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tin No. 4 of the Council is a survey of American methods of tin can manufacture. Generously illustrated by exceptionally good photographs all phases of the industry from mining of the ore to the testing of the finished can are dealt with. Particular attention is given to the construction, lining, decoration and closing of the different styles of tinned cans. Bottle caps, closures and sealing compounds are also covered. A statistical review of the American tin plate industry as well as a discussion of its future is included.

PATENTS

Chewing Gum Base Made From Polymerized Vinyl Acetate, Sulphur and a Plasticizer—George James Manson, Hawkesbury, Ont., Canada. No. 2,069,477. Feb. 2, 1937.

Darkening of Peeled Potatoes Prevented by 3 per cent Solution of Benzoate of Soda—Edward G. Jansen, Sheboygan, Mich. No. 2,069,884. Feb. 9, 1937.

Cumarone Resins Purified for Use as Chewing Gum Base—George A. Hatherell, Burbank, Calif., to Frank A. Garbutt, Los Angeles, Calif. No. 2,070,047. Feb. 9, 1937.

Extracted Honey Clarified by Filtration Without Heating to Temperatures Destructive to Delicate Flavor and Without Darkening in Color—Rex E. Lothrop, Clarendon, Va., and Howard S. Paine, Chevy Chase, Md. Dedicated to free use of the Public. No. 2,070,171. Feb. 9, 1397.

Pectin Added to Ice Cream Mix at the Rate of 1 to 2 oz. per Gal. of Ice Cream to Increase Bulk and Aid in Elimination of Undigested Residue of Normal Ice Cream Constituents—Clarence G. Spalding Milford, Conn. No. 2,070,455. Feb. 9, 1937.

Mechanically Refined Chocolate Spread to Thin Layer and Subjected to 100 Deg. C. Air for Drying and Then Held at 80 Deg. C. to Develop Aroma—August Beck, Wernigerode, Germany. No. 2,070,558. Feb. 16, 1937.

Acid Pectin Solutions Freed of Lead and Calcium by Treatment With Alkali Metal Oxalates, Ammonium Oxalate and Oxalic Acid—Victor E. Speas, Nathan M. Mnookin and Arthur C. Metcalf to Speas Manufacturing Co., Kansas City, Mo. No. 2,070,870. Feb. 16, 1937.

Peroxide-Leavened Cereal Flour Dough Stabilized Against Loss of Oxygen at Room Temperature by the Addition of Soluble Carbonate and Phosphate Which at Baking Temperatures Do Not Interfere With Complete Breaking Down of Hydrogen Peroxide—Joseph S. Reichert and William J. Sparks, Niagara Falls, N. Y., to E. I. duPont de Nemours & Co., Wilmington, Del. No. 2,070,922. Feb. 16, 1937.

Concentrated Coffee Extract Made From Water Infusion of Ground Roasted Coffee by Evaporating One-Half of Infusion Under High Vacuum at Temperature Not to Exceed 125 Deg. F. and Mixing With Other Half of Original Infusion—Gerald L. Wendt to Coffee Products Corp., New York, N. Y. No. 2,071,011. Feb. 16, 1937.

Lactic Acid Compounds Prepared From Whey by Alkalinization, Heat Treatment and Neutralization of the Solution—Arnold H. Johnson, Samuel M. Weisberg and James J. Johnson, Baltimore, Md., and Milton E. Parker, Danville, Ill., to Research Laboratories of the National Dairy Products Corp., Inc., Baltimore, Md. No. 2,071,346. Feb. 23, 1937.

Condensed Buttermilk Product Preparation Aided by Treatment With Enzyme to Digest Hydrated Colloidal Constituents—Samuel M. Weisberg and Arnold H. Johnson, Baltimore, Md., and Milton E. Parker, Danville, Ill., to Research Laboratories of the National Dairy Products Corp., Inc., Baltimore, Md. No. 2,071,367. Feb. 23, 1937.

Lactic Acid Compounds Made From Whey Through Use of Absorbing Agents to Remove Albuminous and Other Undesirable Substances in the Presence of Alkali—Samuel M. Weisberg and Henning A. Crebler, Baltimore, Md., and Frank L. Chappell, William E. Springer and Stoddard Stevens, Hobart, N. Y., to Sealtest System Laboratories, Inc., Baltimore, Md. No. 2,071,368. Feb. 23, 1937.

Malt Dried in a Kiln Having an Air Circulating System That May Operate Either on a Closed or Open Cycle—Leon Zihler, Winnipeg, Man., Canada. No. 2,071,448. Feb. 23, 1937.

Animal Fats Stabilized Against Oxidation by Absorption of Fat-Soluble Lipins From Lipin-Containing Parts of Carcass—Wilson F. Douglass, Council Bluffs, Ia., to Cudahy Packing Co., Chicago, Ill. No. 2,071,457. Feb. 23, 1927.

Packaged Bakery Products Preserved by Treatment With Solutions Containing Volatile Antiseptic Agents, Which After Driving Off Solvent, Leave a Residue That Becomes Gaseous at Higher Than Room Temperatures—Louis W. Haas, Chicago, and John W. Read, Glen Ellyn, Ill., to W. E. Long Co., Chicago, Ill. No. 2,071,625. Feb. 23, 1937.

Sugar Juices Purified and Refined Through Adding Alkali and Acid Electrolytes to Obtain Optimum Isoelectric Point for Further Treatment to Remove Colloidal Impurities—Dario Teatini Hougaerde, Belgium. No. 2,071,776. Feb. 23, 1937.

Water for Carbonated Beverage Purposes Freed of Carbonate Alkalinity—Howard L. Tiger to Permutit Co., New York, N. Y. No. 2,071,990. Feb. 23, 1937

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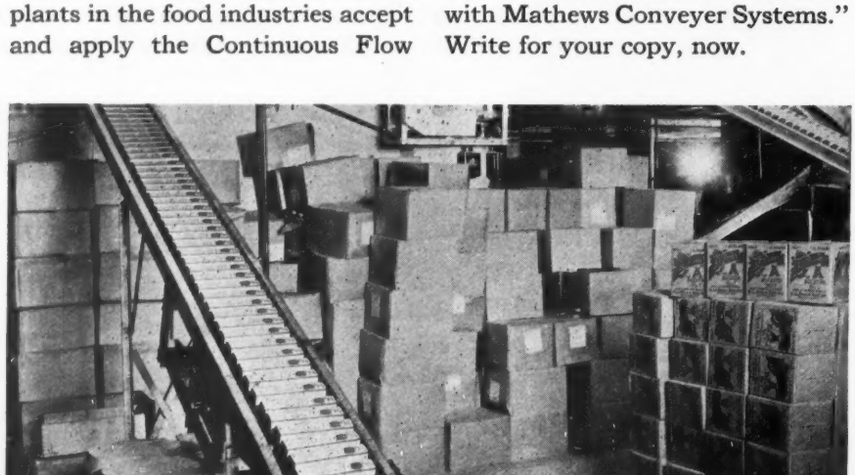

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CENTRIFUGAL SEPARATION

A Unit Operation That Permits Economy in the Separation of Solids or Liquids from Other Liquids

By T. R. OLIVE
Associate Editor
Chemical and Metallurgical Engineering
New York, N. Y.

A UNIT OPERATION OF FOOD ENGINEERING

Centrifugal Separation

►Strictly mechanical separations of solids from liquids, as of sugar crystals from syrup, and of liquids from liquids, as cream from milk, can generally be made by gravity alone. But such a separation is a lengthy operation, requires much floor space, and is hard to control. As shown in this article, centrifugal separation speeds up the operation and makes possible easier control.

This is No. 10 of a series on the unit operations of food engineering.

A CENTRIFUGAL, or centrifuge, is a machine designed to separate solids from liquids, or liquids from liquids, by the application of centrifugal force. Although it is believed that the first use of this force for effecting a separation was made many centuries ago by the Chinese, in purifying a non-food product, tung oil, the modern history of this machine is definitely associated with the food industries. The first filtering type centrifugal was developed by David Weston, about 1852, for use in the sugar industry. The first non-filtering centrifugal was the cream separator, the invention of Carl Gustaf-Patrick DeLaval, whose first successful model was developed in 1878.

Fundamentally, a centrifugal is a settling machine. That is, it takes a mixture of materials which in most cases would stratify under the action of gravity if allowed to settle long enough, and by substituting centrifugal force for gravity, enormously hastens the settling process. Consider an intimate mixture of water, oil and a solid which is heavier than either of the other two materials. When the mixture is placed in a bowl, three layers will eventually form, as in Fig. 1, with the heaviest material, the solids, at the bottom, and the lightest material, the oil, at the top. The speed with which this separation will take place is shown by Stokes' law which states that the settling velocity of a particle in a fluid is proportional to the expression:

(particle radius)^2 x (specific gravity difference) x (accelerating force) ÷ (viscosity of fluid)

Thus it is clear that settling rate can be increased by increasing any of the three factors in the numerator, or by decreasing the viscosity of the fluid. One method actually used is to cause groups of particles to coalesce by chemical or other means, and so increase the effective particle size. Another is to heat the fluid and so decrease its viscosity. But by far the most potent means for increasing the speed of settling is to increase the third factor in the numerator, the accelerating force, for by means of centrifugal machines this can be made as high as de sired. So powerful is this method that particles too fine ever to settle out under the action of gravity alone can readily be recovered by centrifugal settling. Emulsions which otherwise would stand indefinitely are in most cases easily broken by this means, and the components separated.

Centrifugal force is the force that must be applied to a moving object to distort its path from a straight line. When a stone is whirled around the head on the end of a string, the pull in the string is centrifugal force, and the sharper the turn (that is, the shorter the string) the greater will be the centrifugal force for a given velocity of rotation. Mathematically this force is expressed by the equation:

$$F = K\ N^2\ r$$

where F is the force "times gravity"; K is 0.0000284; N is the number of revolutions per minute; and r is the radius of the path of the object, in inches.

Now consider that the bowl of Fig. 1 containing the mixture of solids, oil and water is whirled rapidly, instead of being allowed to settle. The mixture will climb up the sides of the bowl as in Fig. 2, and in a short time will stratify perfectly owing to the fact that the accelerating force has been increased enormously by the rotation. Just how large this increase can be is shown in part by Fig. 3 which is a nomographic chart for solving the force equation given above. Even this chart does not tell the entire story, for it applies only to medium speeds of rotation not over 6,000 r.p.m. Yet there is one type of commercial centrifugal, of which there are many in operation today, which rotates at 15,000 r.p.m., giving a separating force nearly 15,000 times gravity. Laboratory machines of the same make are driven as rapidly as 50,000 r.p.m., producing a force 62,000 times gravity. Another special type of laboratory machine installed not long ago by a large chemical concern can actually be operated at 160,000 r.p.m., generating a centrifugal force 1,100,000 times gravity.

One more point should be considered before passing to a discussion of the actual machines, and that is the mechanical effect of rapid rotation on a centrifugal bowl. The stresses in the bowl of a centrifugal are proportional to the peripheral speed, which depends on the first power of the rotational speed and the radius of the bowl. But the separating force is proportional to the radius of the bowl, and to the *square* of the rotational speed. Hence, to avoid impractically high stresses, large diameter machines can operate only at relatively low speeds, producing a comparatively low separating force. For the same bowl stress, the smaller in diameter the bowl is, the more rapidly it can be rotated, and the higher the force it will produce. A 40-in. basket at 1,200 r.p.m. will give a separating force 800 times gravity, as in Fig. 3, while a 6-in. bowl at 15,000 r.p.m. will generate nearly twenty times the force, with less than twice the peripheral speed. Such tremendous forces are not always necessary, however, and for other practical reasons there are many uses for large diameter, slow speed centrifugals, as well as for those of intermediate size and speed.

It was stated in an earlier paragraph that there are filtering and non-filtering centrifugals. It will be well to explain just what is meant by this classification. In the first place, small and medium diameter centrifugals are all of the non-filtering type, and in these the materials to be separated are rotated and made to

settle, or stratify, within a solid, hollow bowl or between conical disks within a solid bowl. In the great majority of these machines liquids are fed in and removed continuously, while if solids are present, these will be deposited on the bowl wall and must later be removed manually. On the other hand, with the exception of small laboratory models, the filtering type of centrifugal is almost invariably of the large diameter type.

It has already been explained how materials stratify in accordance with their relative specific gravities within a solid bowl machine. Something quite different takes place in the filtering type, however. In such a machine, a perforated basket of some suitable filtering medium is substituted for the solid bowl. When the basket is rotated, the mixture of solids and liquids which is fed to it deposits on the basket sides, as in Fig. 2, and the solids are driven firmly against the filtering surface, but the liquids are forced through and are thrown from the basket into a casing or "curb" which surrounds it. Thus this type of centrifugal is evidently a means for the rapid separation of large quantities of liquids and solids, when the latter are of a type to be relatively free filtering. Sugar is an outstanding example of a product handled in equipment of this type.

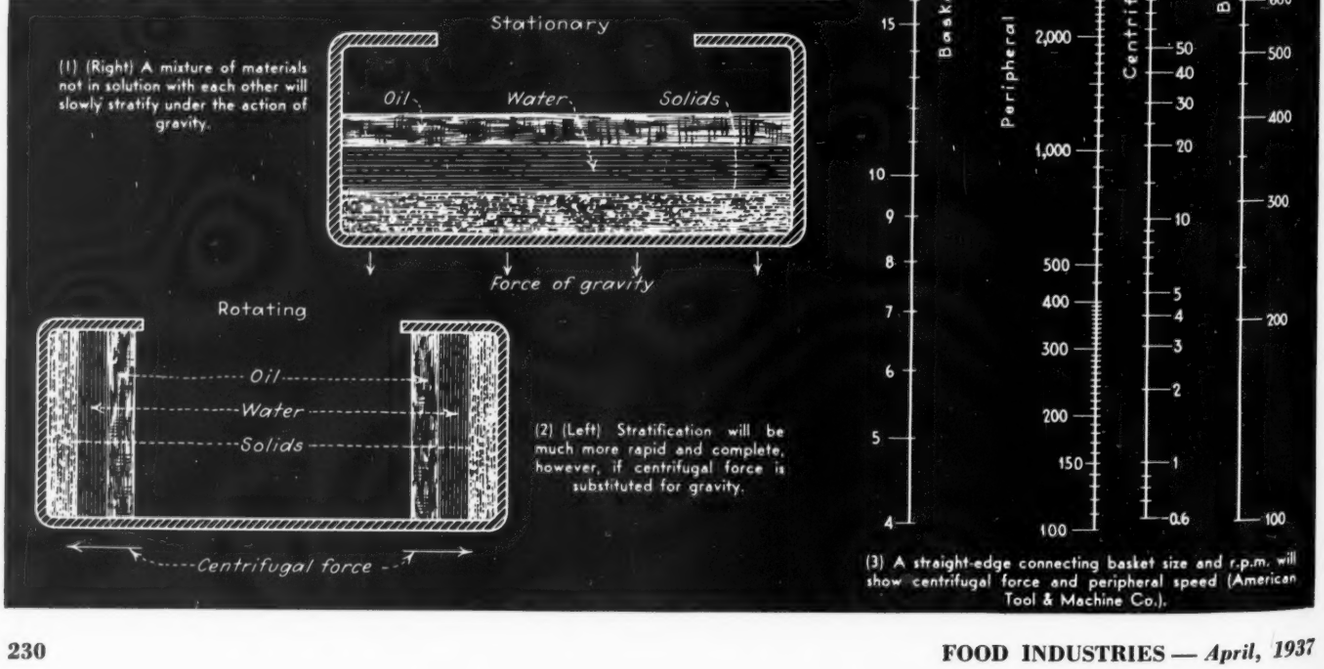
Not all large diameter centrifugals are of the filtering type, however. Makers of this type of machine also supply solid baskets of large diameter for use when a settling centrifugal is required for the clarification of large quantities of liquid containing a relatively small quantity of solids which are not too difficult to settle out. In both this type and the filtering centrifugal, liquids are removed continuously, but the solids must be removed by hand. To obivate the batch and manual character of ordinary machines of the large diameter types, therefore, modifications have been introduced for use on certain sorts of products. These are of two varieties, both of which are built in both the filtering and the settling types. One is semi-continuous, making use of a horizontal basket (or bowl) from which the accumulated solids can be plowed occasionally, as required, while the machine is running at full speed. The other uses a basket (or bowl), which may be either horizontal or vertical, within which is a rotating scraper that continuously removes the solids as rapidly as they are deposited.

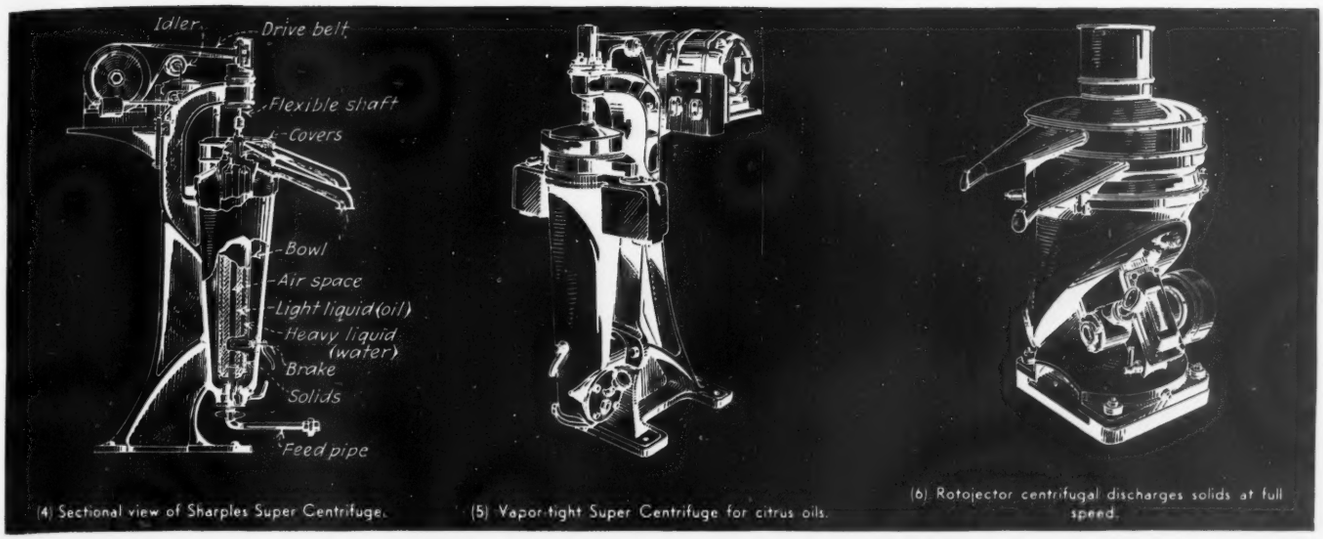
High Speed Centrifugals

The first of the types to be described is the high speed centrifugal, known commercially as the Super Centrifuge. This machine, made only by the Sharples Specialty Co., consists essentially of a solid, tubular bowl not over 6 in. in diameter, and several times this dimension in length. This bowl is supported in a vertical position by a flexible shaft and thrust bearing, the bottom being loosely guided by means of a spring mounted bushing. This arrangement permits the bowl to seek its proper center of rotation should it become slightly out of balance. The bowl is rotated within a cast metal casing, either by means of a direct connected steam turbine, or by a special type of cotton belt, driven either from a motor pulley or from a speed increasing gear belted to a line shaft. This construction will be evident from a study of Fig. 4.

Materials to be separated are fed into the bottom of the bowl, as it is rotating. The usual speed is 15,000 r.p.m. and the separating force nearly 15,000 times gravity. A set of vertical baffles, called a three-wing, loosely placed within the bowl immediately brings the entering material up to bowl speed, throwing it against the wall where, as it flows upward toward the discharge, its constituents separate and stratify according to their specific gravities. Any solids present will deposit on the bowl wall, while two or more liquids will separate so that the heaviest is against the wall, while the others will float on its surface, the lightest toward the center. It is, of course, understood that to be separable the liquids must not be soluble in each other. Thus, water can be separated from an oil insoluble in it, even if an emulsion has been formed, but water cannot be separated from alcohol, for example, nor can it be separated from a dissolved solid. No centrifugal has ever been developed with power enough to effect such a separation.

The construction of the top of the Super Centrifuge bowl varies depending on the use that is to be made of it. For the re-


(1) (Right) A mixture of materials not in solution with each other will slowly stratify under the action of gravity.
Stationary
Oil
Water
Solids
Force of gravity
Rotating
Oil
Water
Solids
Centrifugal force
(2) (Left) Stratification will be much more rapid and complete, however, if centrifugal force is substituted for gravity.
Basket Diameter, Inches
Peripheral Speed of Basket, Feet per Minute
Centrifugal Force, "Times Gravity"
Basket Speed, R.P.M.
(3) A straight-edge connecting basket size and r.p.m. will show centrifugal force and peripheral speed (American Tool & Machine Co.).



(4) Sectional view of Sharples Super Centrifuge. (5) Vapor-tight Super Centrifuge for citrus oils. (6) Rotojector centrifugal discharges solids at full speed.

moval of a solid from a single liquid, an operation known as clarification, only a single opening at the center is necessary. For the separation and discharge of two liquids, a center opening and a ring-shaped opening at the periphery are used. As in Fig. 4, these openings communicate with separate covers to receive and discharge the separated liquids. Generally, solids are discharged from the bowl by stopping the machine, dismantling the bowl by removing the bottom piece, and cleaning it by hand. However, one form of bowl has been developed for the continuous discharge of solids by floating them on a heavier liquid. For instance, in recovering refined vegetable oil from the soap stock produced during the refining, a soap-oil-water emulsion is obtained. When this is treated with salt and passed through the centrifuge, the brine goes to the wall, the salted-out soap floats on the brine and discharges with it, while the oil discharges from the center opening. The petroleum refining industry uses a similar process in which wax is caused to precipitate from oil by chilling, and is removed from the centrifuge on a film of water which is maintained against the bowl wall. The only method by which it is possible to prevent adherence of solids to the wall in this type of centrifugal is by the use of a carrier liquid as just described.

A modification of the Super Centrifuge which is employed when contact of the air with the liquids being processed is detrimental or dangerous, and positively to be avoided, is a machine equipped with a gas tight housing which incloses the bowl and covers entirely. This construction is suitable for use where an inflammable liquid is being handled which, in contact with the air, might form an explosive mixture. For moderate vapor-proofness, another type is made in which tight fitting covers are provided for distributing the separated liquids. This type, shown in Fig. 5, has been developed particularly for the separation of citrus and other essential oils, both to avoid loss of the oil vapor and to prevent contact with air. A bronze housing, Monel metal bowl and stainless steel covers are used.

Another type of high speed machine, made by the same concern and known as the Rotojector, has been developed for the semi-automatic discharge of solids in a thickened condition. This machine, Fig. 6, is intended for the clarification of liquids containing up to 10 per cent of solids, particularly those which do not filter readily, or for the clarification of a mixture of two liquids with up to 10 per cent solids. Solids are discharged intermittently, as they accumulate in sufficient volume, while the bowl is running at full speed. The bowl consists of an inner vessel that slides within a casing, uncovering an annular slot through which the solids are ejected. When such discharge is required, water is admitted to a special space in the bowl and its hydrostatic pressure, produced by the rotation, serves to open the slot which is normally kept closed by springs.

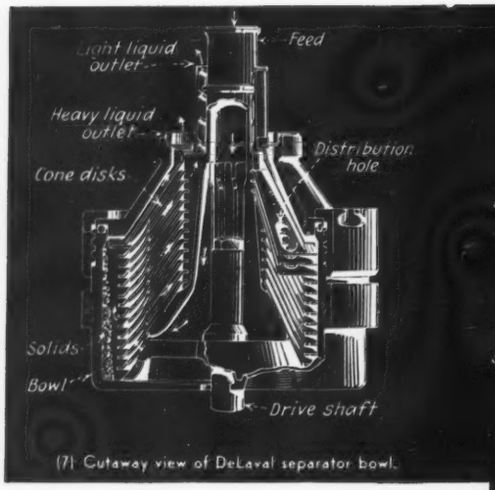
Medium Speed Centrifugals

By far the greatest number of centrifugals in use are of the medium speed type, largely based on the early designs of DeLaval. The only exception is the so-called test tube type of laboratory centrifuge in which a head, carrying two, four or more cups supporting bottles or graduated test tubes, is rotated at speeds up to 6,000 r.p.m. by hand, motor or turbine. Such centrifuges are used for determining the quantity of water and sediment in oils and the butterfat in milk (Babcock tester).

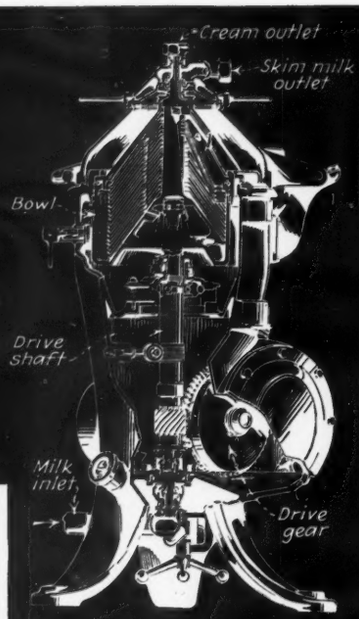
It is estimated that well over a million centrifugals of the disk-bowl (DeLaval) type are produced during an average year, for the most part for the dairy industry. It has already been noted that the first solid bowl machine, of 1878, was a cream separator. Since that early machine the applications of the present DeLaval type of disk bowl centrifugal, which was developed something over 40 years ago, have spread so as to cover a very large number of different uses. Not only does this type today take care of most of the world's cream separating business, but it also is used extensively in separations once thought to be possible only with the highest speeds attainable. The disk bowl was worked out with the idea of giving the materials to be separated only a very short distance through which they must settle. Consequently, to do so, the space within the bowl was divided by a stack of conical disks into a large number of parallel paths, each of which, in most designs, is not over about 1/20 in. in thickness. How this is done in a typical DeLaval bowl is indicated in Fig. 7 which portrays a separator for two liquids and a solid. It will be noted that the space between the disks is small in relation to the length of passage so that during the total travel of the materials between the disks, they have ample opportunity to stratify in the manner desired.

In the tubular bowl, high speed machine the mixed materials enter at one end and discharge at the other. In the disk bowl machine, however, they enter at some point other than the ends of the channels between the disks, and assume wedge-shaped formations under the action of the centrifugal force. The lighter material moves inward along the upper side of the disks, while the heavier liquid, carrying any solids, moves outward along the under side of the disks. For any given design of bowl, and relative densities of the two liquid components, a neutral zone will be established, corresponding to the boundary between the heavy and light layers which we saw were formed in the tubular bowl machine. Consequently, it is desirable to introduce the feed as nearly as possible in this neutral zone, and this is done through a series of vertical rows of holes through the disks, as shown in Fig. 7. The position of the neutral zone can be adjusted as desired by choosing a suitable size for the discharge lip for either or both of the components. These lips are the dam-like rings over which the separated liquids leave the bowl at the top.

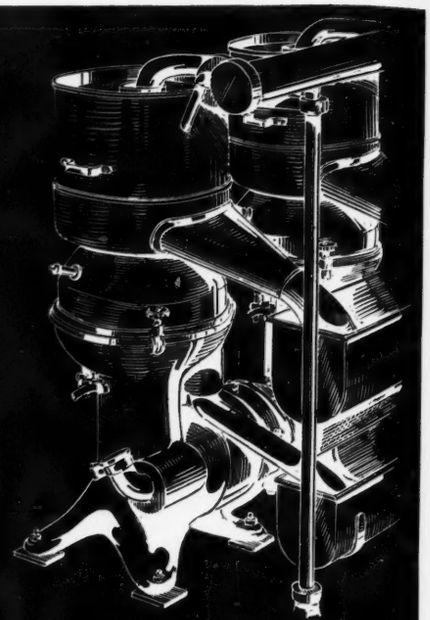
The reason why it is necessary to be able to choose the position of the neutral zone is because, in so doing, it is possible to distribute the centrifugal effect between the two components. In a cream separator, for example, it is necessary to exert the principal separating force on the heavier component, the milk, for the amount of butterfat left in it must be reduced



(7) Cutaway view of DeLaval separator bowl.



(8) DeLaval airtight cream separator operates under pressure.


(9) Continuous yeast concentration is handled with this machine.

to negligible proportions. The cream, on the other hand, must contain some milk for fluidity, and even the 80 per cent product does contain milk. In a cream separator, therefore, the feed holes and the neutral zone are brought near the center of the disks, so that the milk receives the greater exposure to the centrifugal force. But in a purifier for removing water from oil, it is the lighter component, the oil, which must have the greater exposure, and in such a machine the neutral zone will be displaced to a region near the outer edge of the disks. In either event the solids that may be present will receive an even greater exposure, for being of greater specific gravity than the liquids, they will travel to the extreme outside of the bowl, where they will be deposited in the sediment space provided, later to be removed when sufficient have accumulated, by disassembly and cleaning of the bowl.

All disk bowl centrifugals, then, operate in a manner similar to that described. Slight differences in construction adapt the machine to various uses. The most recent design of DeLaval cream separator, for example, is shown in Fig. 8. This model is airtight, so that both the cream and the milk can be delivered under pressure and may be piped to an elevated tank. It differs from the standard top-feed models in a number of respects, but principally in the fact that the whole milk enters, under pressure of a pump, through the hollow shaft which supports the bowl. The separated cream is delivered at a point at the exact center of the bowl, where the centrifugal force is zero, so that the cream is not agitated and a better body and texture are said to result. As all air is excluded, there is no foaming. The machine is driven in a manner similar to other disk bowl centrifugals, that is by means of a vertical shaft held in flexibly supported ball bearings, driven by a speed increasing worm and worm gear from a direct connected motor, a steam turbine or a line shaft. Except for the turbine driven types, these machines have a centrifugal clutch interposed between the power source and the worm gear, through the use of which the bowl is rapidly brought up to speed, automatically, without excessive loading of the motor. A similar clutch for large centrifugals will be described in a later section.

Another modification of the fundamental type is the DeLaval yeast concentrator. Shown in Fig. 9, this machine clearly differs in the bottom construction of the bowl, as shown by the shape of the housing. For bacteriological reasons the modern method of yeast production requires extremely rapid separation of the yeast from the wort, in as high a concentration as possible. It is for this reason that centrifugals are used. The yeast concentrator is a comparatively low speed machine, with top feed. The concentrated yeast gravitates toward the outside of the bowl where it enters a number of nozzles, projecting back tangentially toward the center, and is discharged continuously into an annular receptacle from which it leaves the machine. The wort, being lighter, leaves the center of the disks and flows upward into a hood placed below the feed tunnel.

Still another special modification is the whole milk clarifier developed by DeLaval. Like the cream separator this machine is made both in open top-feed and airtight bottom-feed designs, but unlike the former, the clarifier has as its object only the removal of dirt, without separation of butterfat. The milk is therefore introduced between the disks near their outer edge, and only one liquid discharge is provided, at the center. Solid matter accumulates in the large sediment space provided at the outside of the bowl and the milk, without separation, passes out the center of the bowl. Similar machines are used for other clarification problems where but one liquid is to be handled.

BOTH HIGH AND MEDIUM SPEED SETTLING CENTRIFUGALS have been described in the preceding paragraphs. As has been mentioned, there are also low speed settling machines which should, perhaps, logically be described at this point. Since they are much less important than the filtering type of low speed machine, however, they will be taken up at a later time.

Filtering Centrifugals

In an introductory section it was explained that the two fundamental differences in centrifugals relate to the type of bowl wall used, that is, whether solid or perforated. The first makes use of settling to effect separation, while the second retains the solids and permits the liquids to filter off, under the high centrifugal pressure induced by the rotation of the bowl (or basket, as it is called in this type of machine). The great majority of centrifugals of this sort make use of a basket 40 in. or more and even up to 72 in. in diameter, which are operated at speeds from 600 to 1,500 r.p.m., with about 1,200 r.p.m. the most common. The larger the basket, of course, the slower the speed at which it can be driven with safety.

This type of machine is found in four principal variations, which relate not only to the method of supporting and driving the basket, but also to the method of unloading the solids. The most common are the vertical basket types, which are built both in underdriven models and as a basket suspended from a driven shaft. In both variations batches are handled intermittently, it being necessary to slow the machine almost, or actually, to a stop to remove the accumulated solids. Another type is semi-continuous, and may be made fully automatic in operation if desired. This makes use of a horizontal basket supported on a horizontal shaft, from which the solids are plowed out at intervals by a power driven knife while the basket is turning at full speed. The fourth variation is fully continuous and fully automatic. Both horizontal and vertical baskets are used, and these are generally conical. A continuously driven spiral scraper within the basket removes the deposited materials as rapidly as they reach the basket wall.

The suspended basket centrifugal is the most commonly used slow speed type met in the food industries. A typical example

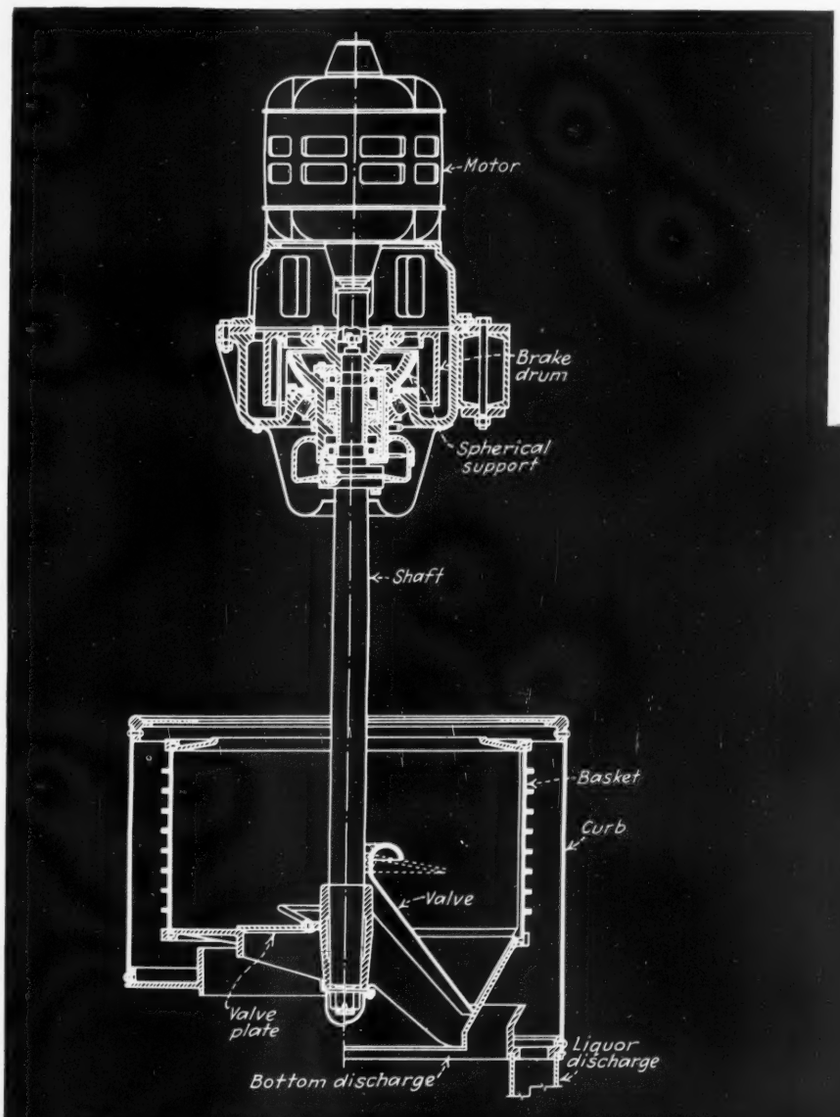
is shown in Fig. 10. The drawing omits the supporting structure which is attached to the cradling device shown below the motor. The basket as drawn is really two half sections, that on the left being a flat bottom basket, which must be discharged through the use of a plow or other manually controlled device, while the half basket on the right represents a conical bottom, self-discharging type. The latter drops the solids after the conical valve has been raised, as soon as the speed of the basket has been lowered sufficiently to permit gravity to slide material from the sides. This type is becoming less important as centrifugal speeds are being raised, for at higher speeds, even those materials which would slide out of such a basket under lower speed operation, tend to pack too solidly for self-discharging.

A few words about the construction of this machine are in order. This particular design is from the American Tool & Machine Co. but, except for minor variations, it will serve to illustrate the great majority of centrifugals of the suspended type. A fully loaded basket of sugar massecuite, for example, will weigh several hundred pounds, and the method used in supporting, driving and stopping it are important. In the past, belt drive was common, but in recent years the tendency has been toward direct motor connection, using a vertical motor as shown. Generally the motor is directly connected as in this design, but less commonly the connection is through a centrifugal clutch.

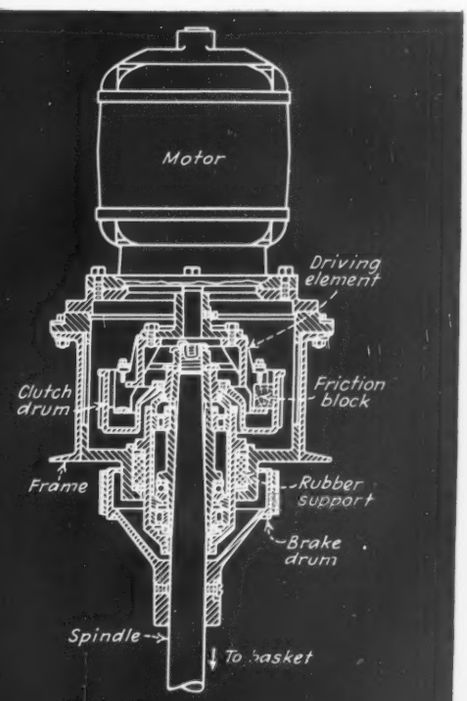
In all machines some provision must be made to permit a certain amount of gyration of the basket so that the spindle must be supported flexibly. Notice that the spindle bearing assembly, which consists of two radial bearings and a thrust bearing, is carried in a stationary cylindrical element terminating at the top in a spherical portion. This is supported on a spherical bearing surface which is part of the frame, and the assembly is restrained from motion by a resilient ring placed between it and the frame. Should the basket become unbalanced through poor loading, the spindle and bearing assembly are thus permitted some sidewise movement, so that the basket can rotate about its true center.

Another requirement of this type of centrifugal is an efficient brake. Medium and high speed centrifugals also have brakes but it is only with the high momentum, large diameter type that braking becomes especially important. In Fig. 10 the brake drum (but not the band) is shown attached to the upper part of the shaft. Sometimes it is necessary to water cool the brake, and a jet for this purpose is indicated. In the operating cycle of such a centrifugal, speed is usually essential. This will be evident when it is considered that in the sugar industry, for instance, the aim is to attain a cycle of three to five minutes. The basket must be accelerated to a loading speed of about 300 r.p.m., the load of sugar crystals and syrup poured in from a conveniently located spout, the basket increased in speed to the maximum and spun until the syrup has been "whizzed" off to the greatest practicable extent, a spray of water turned on for washing, the brake applied and the basket slowed down to unloading speed of 25 to 60 r.p.m. Then the unloader must be swung into action, the sugar plowed out, and the cycle repeated. It is clear that not much time in this cycle is available for braking.

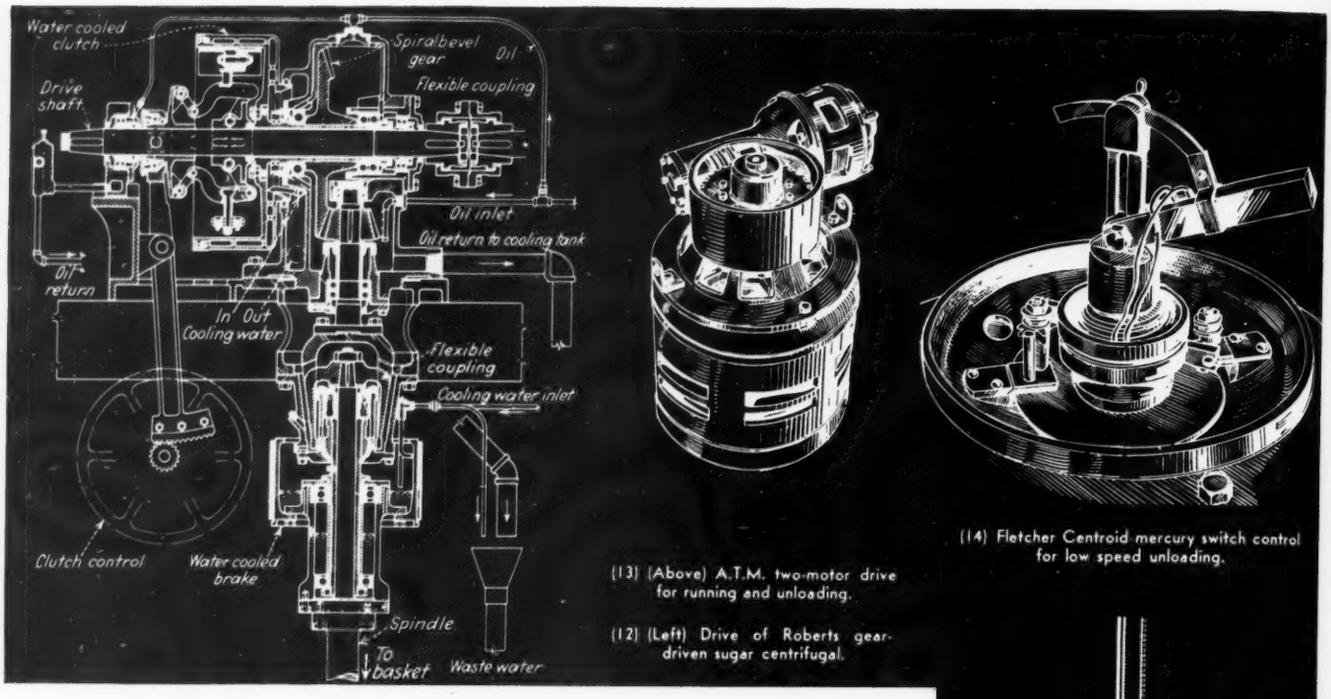
The construction of the basket itself is also of interest. In the early days it was not uncommon for centrifugal force to tear a basket to pieces, so that the curb had to be depended on not only to catch the syrup and direct it to the discharge, but to catch the basket pieces and save the life of the operator, as well. Owing to improved construction, such explosions are practically unheard of today. Modern baskets consist generally of a composite, including an outside envelope of perforated metal with rings of considerable width. Inside this is a cylinder of coarse wire mesh, to serve as a drainage area, while the inner filter-



(10) This machine is typical of suspended basket centrifugals; left half basket is flat-bottom type; right half basket is self-discharging type.



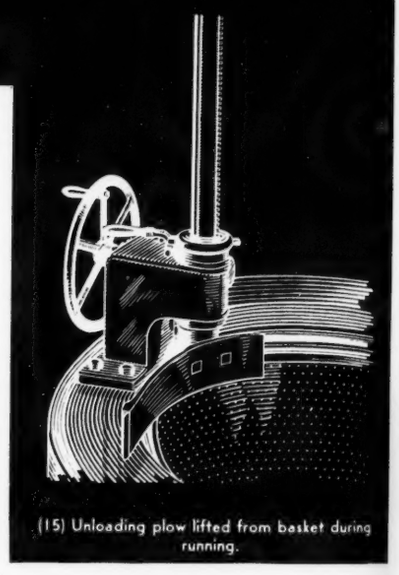
(11) Detail of Tolhurst centrifugal clutch, spindle support and bearings.



(13) (Above) A.T.M. two-motor drive for running and unloading.

(12) (Left) Drive of Roberts gear-driven sugar centrifugal.

(14) Fletcher Centroid mercury switch control for low speed unloading.



(15) Unloading plow lifted from basket during running.

ing surface is made of fine wire screen, or finely perforated metal, the aperatures of which are small enough to retain the solids, while permitting free passage of the liquids. Other factors which make today's baskets safe include the care with which they are assembled and balanced, the use of welding rather than riveting in most cases, and even more important, the use of better construction materials. No matter how well a basket is built, corrosion will make it a potential menace. Such materials as stainless steel. Monel metal and bronze are now regularly used and rubber covering is sometimes resorted to, so that the careful design and construction built into the basket will be preserved. Thus, an occasional competent inspection will guarantee its safety.

It has been mentioned that a few centrifugal manufacturers use a centrifugal clutch for connecting motor and basket, to assist in bringing the basket up to speed in the smallest possible time, and with the least load on the motor. Fig. 11 shows such a clutch, as built by the Tolhurst Division of American Machine & Metals. This drawing also shows another method of mounting the brake drum, and of supporting and giving flexibility to the shaft. In this design the motor drives a horizontal element containing pockets in which are a number of blocks of friction material, within a clutch drum attached to the basket shaft. In starting, the clutch permits the motor to accelerate almost to full speed before the load is applied. At this speed the whirling friction blocks are pushed out against the clutch drum with sufficient force to begin to transmit power. Slipping takes place at first, but as the basket accelerates, and the motor reaches full speed, the slippage decreases until the basket has attained full speed. Such a clutch makes it possible to use a considerably smaller motor, of better electrical characteristics. Power consumption is less in starting. And for unloading, the use of a second, low-torque winding in the motor, in conjunction with the controlled slipping of the clutch that takes place at low speed, permits the operator readily to hold the desired low basket sped as long as necessary.

A method of driving which has come into prominence in recent months, but only in connection with sugar centrifugals at present, is illustrated in Fig. 12. This shows the Roberts drive, used by the Western States Machine Co. In both the production and refining of sugar, centrifugals constitute very nearly the most important type of equipment in the factory. Dozens of them are required in a large refinery, and their efficiency largely determines the speed and economy of the entire process. Hence, in sugar particularly, rapid acceleration and braking are especially necessary. This is the aim of the drive shown. Formerly, sugar centrifugals were driven in groups from a line shaft. Then for a time, the tendency was toward individual motor drive, either through a belt or by direct connection. None of these machines, however, were able ordinarily to operate at a higher speed than 1,200 r.p.m., and acceleration was relatively slow. In the new drive, the group arrangement has again become of interest, six machines being driven from a line shaft by a single large motor. But, here is the difference: As in Fig. 12, which shows the drive for a single centrifugal with its section of line shaft, each centrifugal is connected to the shaft by a water-cooled friction clutch and driven through spiral bevel gearing. Furthermore, the new centrifugal operates at 1,500 r.p.m. and can be accelerated from the loading speed of 300 r.p.m. to top speed in only about 40 seconds.

Several factors contribute to this remarkable acceleration. In the first place the advantages of friction clutch starting are obtained, with water cooling of the clutch to dissipate the heat generated by slippage during acceleration. In the second place, the six centrifugals of a group operate in rotation so that at any given time, one will be starting, three will be running at full speed, one will be unloading and one will be stopped. The flywheel effect, then, of the three that are running, assists materially in bringing the starting machine up to speed, without undue load on the motor. Not only has this drive improved the operating cycle, but it has also made possible a more complete separation of sugar and syrup, decreased the wash water required and so reduced the total amount of processing required to accomplish a given recovery of sugar.

The fact that a basket centrifugal must be held at a relatively low speed in unloading has already been mentioned. The method of accomplishing this with a centrifugal clutch has been described. A common but not particularly satisfactory method is for the operator to apply power to the basket momentarily and frequently, just enough to keep it at the correct speed. Another method is to use a two-speed motor. Two relatively new devices for

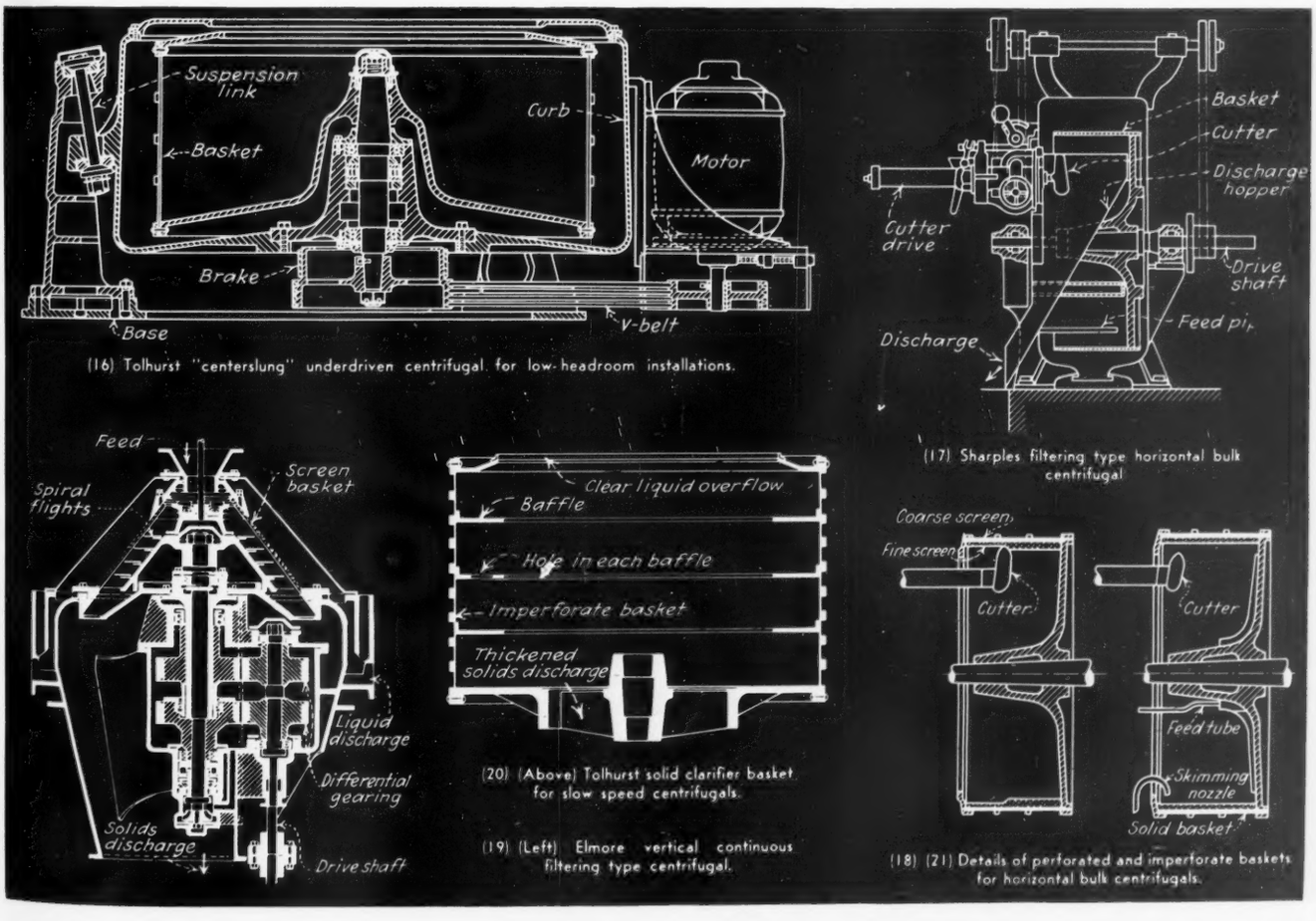
holding a low unloading speed positively are shown in Figs. 13 and 14 The first (American Tool & Machine Co.) consists of two motors, a large vertical motor for accelerating the basket and driving it during the whizzing period, and a small horizontal motor geared down to the main motor and connected to it by a free-wheeling clutch. For unloading the large motor is shut off, the brake applied and the small motor started, its gearing being of proper ratio to hold the desired low speed. The second device, the centroid control made by Fletcher Works (Fig. 14) is a centrifugal switch driven in direct ratio to the speed of the motor. It consists of a mercury switch supported in a holder so that its angle with the horizontal can readily be adjusted. It is wired to the motor starter through a pair of slip rings. With the two contact points toward the center of rotation, a rotational speed will be reached which will throw the mercury outward and break the contact, shutting off the power to the motor. Then as the speed falls slightly, contact will again be made. By adjusting the angle of the switch, any desired low speed can thus be maintained, with slight variation. Should several different low speeds be desired, an extra switch can be added for each speed. This method, it will be observed, is an automatic improvement on the expedient of manual jogging of the motor which was mentioned above.

Once the basket has attained the necessary slow unloading speed, some form of plowing device is usually needed to assist the unloading operation. Fig. 15 (American Tool & Machine Co.) is typical of most of this equipment. During loading and whizzing the plow is lifted out of the basket, out of the way. For unloading it is lowered by means of a rack and pinion and held manually against the deposited solids so that the basket rotates toward its tip. The solids then discharge to a container or chute beneath the floor or platform on which the centrifugal rests.

NEXT TO THE SUSPENDED CENTRIFUGAL, the underdriven type is the most commonly used form of large diameter machine. It is found almost exclusively in the laundry and dry cleaning industries, and less frequently elsewhere. One form, a design of the Tolhurst Division of American Machine & Metals, is shown in Fig. 16. Machines of this type are advantageous where headroom is lacking, but since they cannot be discharged from the bottom, as in the case of the suspended centrifugal, they are limited in use to applications where top unloading by hand is possible, or where it is practicable to lift the basket bodily from the machine by means of a crane, and discharge it by dumping. The machine shown is not of the removable basket type. In this design the curb and basket are suspended by means of three links attached to piers supported on a heavy foundation. A V-belt drive is generally employed. One method of making the basket removable is to use a removable lining for the basket proper. Another is to remove the entire basket.

The time and power consumed in accelerating and braking a basket centrifugal can be eliminated by a variety of construction shown in Figs. 17 and 18. This machine, the horizontal bulk centrifugal made by Sharples Specialty Co., operates always at top speed, even during discharge. This is possible because, with the horizontal basket, a chute for the discharged solids can be installed through the basket opening. The machine is brought up to speed and the charge run in through a pipe which distributes it evenly over the surface of the basket. After enough time has elapsed for the drying (and washing, if necessary), a cutter which is operated either mechanically or hydraulically is brought into contact with the deposited solids and pushed across, parallel to the side of the basket as in Fig. 18. The cycle of loading, whizzing and discharge can be controlled manually, or if desired, can be made fully automatic through the use of a time cycle controller and appropriate auxiliary equipment.

Still one further step in basket centrifugal design has been undertaken and is represented in a number of different makes. This is the fully continuous type, one example of which, the Elmore, is shown in Fig. 19. In this machine a conical perforated basket mounted on a vertical shaft receives the feed at its small end. Within the basket is a cone-shaped member on the surface of which are spiral scraper flights. This is driven through a differential gear at a speed only very slightly less than that of the basket. Liquid passes through the basket, while the solids



(16) Tolhurst "centerslung" underdriven centrifugal for low-headroom installations.

(17) Sharples filtering type horizontal bulk centrifugal

(20) (Above) Tolhurst solid clarifier basket for slow speed centrifugals.

(19) (Left) Elmore vertical continuous filtering type centrifugal.

(18) (21) Details of perforated and imperforate baskets for horizontal bulk centrifugals.

are scraped off continuously and moved down toward the discharge, aided by the increasing diameter of the basket.

A somewhat similar machine is made in a horizontal design by the Bird Machine Co.

It has been stated previously that large diameter centrifugals may be equipped with solid, rather than perforated baskets, for use in clarification work where the quantity of solids is small in relation to the quantity of liquids, where the solids are not of a readily filterable type and not too difficult to settle. Fig. 20 shows a type of solid basket designed by Tolhurst for the separation and thickening of pulpy or slimy solids. This basket is used in a suspended centrifugal of the type already described. Feed is introduced through a pipe near the bottom of the basket, or bowl, and the liquid discharge is taken off at the top over a discharge lip. Interposed are a number of annular baffles, each of which contains one or more holes for the passage of the liquid. The baffles are necessary to prevent surging but have no function in the actual separation process. This form of bowl is exactly analogous to the tubular, high speed bowl except that the diameter is much greater and the speed and centrifugal force much lower. Its field is in the clarification of large volumes of liquids, where a moderate separation force suffices. It is discharged by stopping the rotation and flushing the solids from the bottom.

Another type of large diameter solid bowl machine is the solid basket horizontal bulk centrifugal of Fig. 21. This machine differs from the perforated basket type of Figs. 17 and 18 only in that the basket has imperforate walls, a skimming nozzle is provided for continuous removal of the liquid, and the feed is projected against the end of the basket so that the longest possible travel is provided before the discharge point is reached. Removal of the solids is accomplished as in the case of the first described machine, as is control of the operating cycle.

The previously mentioned Bird continuous centrifugal is also built in a design which employs a solid bowl and the indications are that it will find wider application in food plants than the screen or filtering type. Like the latter, it operates on a horizontal axis.

Use of Centrifugals

A number of uses in the food field for centrifugals of certain more or less special types has already been mentioned. It is now the intention to discuss the subject more generally, with particular reference to standard equipment.

No complete general statement of the field for centrifugals is possible, for exceptions and amplifications are certain to occur. Centrifugal equipment always has as its object the separation of materials of different specific gravities, either liquids from liquids or liquids from solids. Commercially, a difference of about 3 per cent in specific gravity is generally sufficient for a separation, always provided that the materials are not in solution in each other. Centrifugals will separate materials which will separate through gravity settling, but in addition, they will separate materials which, owing to emulsion or the extremely fine state of subdivision of solids, would not separate by gravity settling. In some of their applications they are directly competitive with filters, and only the circumstances of the particular case will determine which type of equipment should be used. In others, they compete with mechanical presses of one sort or another and again only the circumstances will dictate the proper choice. In still other cases they supplement filters, being used to remove the bulk of the solids, while the filters complete the job. In still others they must be used in conjunction with thermal drying equipment, since it is never possible to remove the last few per cent of liquids from solids in a centrifugal. In certain cases, they compete with evaporation and distillation equipment, but more frequently they are supplementary. In any case, however, it should always be remembered that a separation which can be carried out by mechanical means, as in a centrifugal, press or filter, is cheaper than separation by thermal means, as in a still, evaporator or dryer.

IN DESCRIBING the high speed, tubular bowl centrifugals it was mentioned that they are used for such separations as oil from soap stock and brine in vegetable oil refining, and citrus oils from juice and pulp. A great many other uses have been developed, included among them being the clarification of bouillon, olive oil, butter scotch, cocoa butter, gelatin, molasses and syrups of various sorts, fruit juices such as cider, starch paste, jelly stock, pectin, and extracts such as vanilla. They are used in the clarification of cooking oils and in the recovery of oil from spoiled mayonnaise. Processing of baby foods and the recovery of fish oils and high-vitamin oils from fish livers are other applications. Clarification of concentrated tomato pulp has been accomplished successfully. The Rotojector, which was described as a type for the semi-automatic discharge of solids, is used in the fish reduction industry, for recovering fish oils from scrap, as well as high vitamin oils from livers.

The medium speed, disk bowl centrifugal finds its largest use in dairying, both in cream separation and in milk clarification. Present machines in the industry are capable of production at rates as high as 5 tons per hour per machine. Use of a somewhat similar machine in yeast concentration has been mentioned, also. Among other applications, such centrifugals are used in clarifying wine, for the removal of lees, dregs, dead yeast cells and bacteria, and for fruit juices of all sorts. Other types are employed for clarifying tomato juice and separating olive oil from water and pulp, edible palm oil from its free fatty acid content, and fruit essential oils from juice and pulp.

A special variety of disk bowl, somewhat similar to the one described for the yeast machine, has been developed for the continuous separation of soap stock in the refining of vegetable oils. Still another new type of bowl is being used for the clarification of gathered cream in butter making. Again somewhat similar to the yeast machine, this type employs a series of automatic, intermittent opening orifices in the extreme periphery of the bowl to remove the slime which collects during periods of storage and shipment. Then, there are many miscellaneous uses including the clarification of cooking oils, molasses and syrups, caramels for beverage coloring, and purification of oils for fish canning. Even the microscopic seed oysters with which oyster beds are seeded are recovered from the waters in which they are grown by centrifugal means.

Another class of uses, not directly in food manufacture, but associated with it, is common to both the high and the medium speed types of centrifugal. Plants generating their own power with steam turbines find it necessary continuously to clarify the turbine oil with separators which remove both the dirt and the water. Food manufacturers who operate their own truck fleets, or diesel power plants, find important economies in the recovery of crank case oil by centrifugal separation (plus evaporation).

Among the applications of low speed centrifugals, some are similar to those of the high and medium speed machines and some are unique. Sugar, of course, is the single largest use. The solid basket type has been used in separating insoluble solids from distillers' slop. Much salt is recovered from the mother liquors in filtering type baskets. Tomato and other fruit juices are being clarified in solid baskets, as well as being separated from their pulp. Low speed centrifugals are being used for the removal of moisture from sheep skins in packing plants, and moisture from sausage casings and mushroom spawn. In malted milk manufacture, spent grains are recovered in centrifugals, for use in cattle feed, while undissolved particles are being removed from chocolate syrups and beverages. Centrifugals of this type are used to separate the juices in grape and other fruit pressing, in the production of casein and milk sugar from waste milk, in the extraction of fish oils, in the removal of moisture and fat from potato chips, and in the extraction of caffeine from coffee. Crystallized coffee is similarly recovered. Other applications are found in the production of essential oil extracts, vegetable oils and yeast.

The field for the semi-continuous and continuous slow speed centrifugals is not as broad as that for the filtering and solid bowl batch types, partly because these types require particularly favorable sorts of solids for satisfactory discharge and partly because their higher cost justifies them economically only when large output and material reduction of labor are vital factors. The removal of yeast cells and other solids from a fermentation product and the elimination of filters in the manufacture of malt extracts are examples of applications that have been made with the horizontal bulk type.

A considerable number of installations of the screen type continuous Bird machine have been made in the salt industry, while the bowl type continuous centrifugal is now being applied experimentally, with apparent success, in the dewatering of distillers' slop and in the removal of pulp from fruit juices.